REPRESENTATIONS OF VIRTUAL REALITY IN UK AND US NEWS (2014-2016)

by

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Abstract

This thesis examines representations of virtual reality (VR) within the UK and US press, focusing on six popular VR devices: Google Cardboard, Samsung Gear VR, Oculus Rift, HTC Vive, Sony PlayStation VR and Google Daydream View. As news representations of emerging technologies can strongly influence public opinion about them (Rogers, 2013; Whitton and Maclure; 2015), it is crucial to analyse VR news discourse at this point in time when they have recently become available for consumer use.

Based on a sample of 479 news articles collected from 69 publications (ranging from general news outlets, such as national newspapers, to specialised news outlets, such as those with a focus on technology), a mixed methods approach combining Content Analysis and Discourse Analysis indicates that VR news coverage currently tends to be positive, with some exceptions. On the positive side, VR is commonly represented as revolutionary, exciting, important, immersive, social and advanced high quality technology. Though less common, the negative representations of VR mainly focus on its potential to cause motion sickness and the high cost of the devices. These findings are similar to those from studies of news articles about other emerging technologies (Lewenstein, Gorss and Radin, 2005), but differ from existing research on fictional representations of VR (Chan, 2014) and on media portrayals of videogames (Williams, 2003; Rogers, 2013; Whitton and Maclure, 2015).

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Contents

Chapter 1: Introduction

In 2016, the first modern virtual reality (VR) devices became available for consumer use (Steinicke, 2016). During the emergence of new technologies such as VR, the news may be the general public's first and main source of information about that technology (Williams, 2003; Whitton and Maclure, 2015). This means the news can have a significant impact upon public perceptions of these emerging technologies, which, in turn, can affect their success or failure (Druckman and Bolsen, 2011). Thus, at this crucial time, it is important to analyse how the news are portraying VR to the public.

This thesis explores representations of VR within the news, focusing on the six main competitors within the VR head-mounted display (HMD) market – Google Cardboard, Google Daydream View, Samsung Gear VR, Oculus Rift, HTC Vive and Sony PlayStation VR (Markets and Markets, 2016; SuperData, 2016). Using Content and Discourse Analysis, the study examines a broad range of news articles in print and online publications from UK and US sources.

To position this research, the first part of this chapter discusses some background information about VR and VR devices and outlines public and media interest in VR. The second part of this chapter further highlights the importance of researching this topic, outlines how the study relates to existing research and details the research questions and hypotheses.

A Brief Overview of VR

VR is an immersive and interactive technology designed to make its users feel as if the virtual environment it displays is real (Davis, Bryla and Benton, 2015). The technology has existed for many years and was originally used within the military for flight and battle simulators (Chan, 2014). Though VR is currently used in many

industries, ranging from retail, marketing and business to health care, training and education (Blascovich, and Bailenson, 2011; Parisi, 2016), its main commercial application at this point in time is videogames (Steinicke, 2016). Types of VR include augmented reality (AR), which often takes the form of glasses that overlay virtual objects onto the real world, and VR in the form of an HMD which blocks out the real world and displays a virtual world for the user to view and interact with. This study focuses on press coverage of the fully immersive experiences created by HMDs.

The Sword of Damocles, created by Ivan Sutherland in 1968, is widely considered as the first HMD (Rheingold, 1991; Steinicke, 2016). This was not a commercial VR device but rather a prototype of what Sutherland called the ultimate display (Steinicke, 2016). Commercial VR products, such as Nintendo's Virtual Boy (Dixon, 2016), started to appear after Jaron Lanier coined the term 'virtual reality' in 1986 (Rheingold, 1991). However, none of these were successful in terms of sales (Dixon, 2016). Only recently has technology become advanced and affordable enough for fully immersive VR HMDs to become available for commercial use (Parisi, 2016). VR HMDs such as Google Cardboard and the first consumer version of Samsung Gear VR were released in 2014 and 2015 respectively. Moreover, the Facebook-owned Oculus Rift, HTC and Valve's Vive, Sony's PlayStation VR and Google's Daydream View were all released throughout 2016, causing many to label 2016 as the year of virtual reality (Steinicke, 2016; see, for example, Hoggins, 2016; Kubas-Meyer, 2016).

Current VR Devices

This current trend of VR HMDs can be split into two groups: dedicated VR devices (powered by a computer – though not currently Mac compatible – or games console) and mobile devices (powered by a smartphone). The dedicated devices analysed in this study are Oculus Rift, HTC Vive and PlayStation VR. Oculus Rift

(created by Oculus VR and now owned by Facebook) is the device that started the current VR trend after its development was publicly funded with a Kickstarter campaign (Parisi, 2016). Similar to Oculus Rift, HTC Vive is currently considered to be the highest quality VR device (SuperData and Unity, 2017) available to consumers. Different from other dedicated VR devices, Sony's PlayStation VR connects to the PlayStation 4 (PS4) console for users to experience VR. During 2015, 17.7 million PS4 units were sold (Sony, 2017), compared to 6 million high-end gaming PCs (Gartner, cited in Hulfish, 2017). Therefore, it appears that when these dedicated VR devices were released in 2016, many more households would have owned a PS4 console than the high-end PCs needed for HTC Vive and Oculus Rift. This gives Sony a significant edge over their competitors.

On the other hand, consumers can put their smartphone into a mobile VR device for a (usually) more affordable, though lower quality, VR experience. As the first of these six devices to be released, Google Cardboard is a makeshift VR headset made from just that – cardboard. Consumers can either download the Cardboard blueprint for free and build it themselves with the required components, or buy a pre-made version from Google-supported outlets. Google's next, more sophisticated, attempt at VR came in the form of Google Daydream View. This is still a mobile VR device but is only compatible with higher-end phones such as their own Google Pixel (SuperData and Unity, 2017) for a higher-quality mobile VR experience. The other mobile VR device part of this study is Samsung Gear VR, made with Oculus VR technology. There have been two consumer versions of Gear VR – one released in 2015 and one in 2016. As with Daydream View, Gear VR only works with a limited number of smartphones, all of which are made by Samsung (Samsung, n.d.).

VR Market: Costs and Sales

Because mobile VR devices are powered by a smartphone, they cost considerably less than dedicated VR devices. However, the prices of each headset vary, as do the components needed to use them. In this thesis, the total cost of the HMD plus other necessary components will be referred to as the 'set-up cost' for each device. Table 1.1 details the set-up cost for each VR device included in this study, from least to most expensive.

HMD	**Release Date[1]**	**Type**	**Lowest Set-up Cost[2]**			
			Headset	Power	Required Accessories	TOTAL
Google Cardboard	25/06/2014	Mobile	£20	£75	--	£95
Daydream View	10/11/2016	Mobile	£69	£599	--	£668
PlayStation VR	13/10/2016	Dedicated	£349	£279	£45	£673
Gear VR (2015)	20/11/2015	Mobile	£80	£599	--	£679
Gear VR (2016)	19/08/2016	Mobile	£80	£599	--	£679
Oculus Rift	28/03/2016	Dedicated	£549	£1000	--	£1549
HTC Vive	05/04/2016	Dedicated	£759	£1000	--	£1759

Table 1.1: Set-up Costs of Each VR Device

Note: prices rounded up/down to the nearest pound.

[1]Some devices had different release dates in the US and UK. Whichever was the earliest date is listed here.

[2]Based on recommended retail price at time of release.

(Sources: Ackroyd, 2014; Phillips, 2014; Keach, 2015; Martin, 2015; Boyle, 2016; Graziano, 2016; Keach, 2016; Nunneley, 2016; Argos, n.d.; Google Play, n.d.; Google Store, n.d.; Lenovo, n.d.).

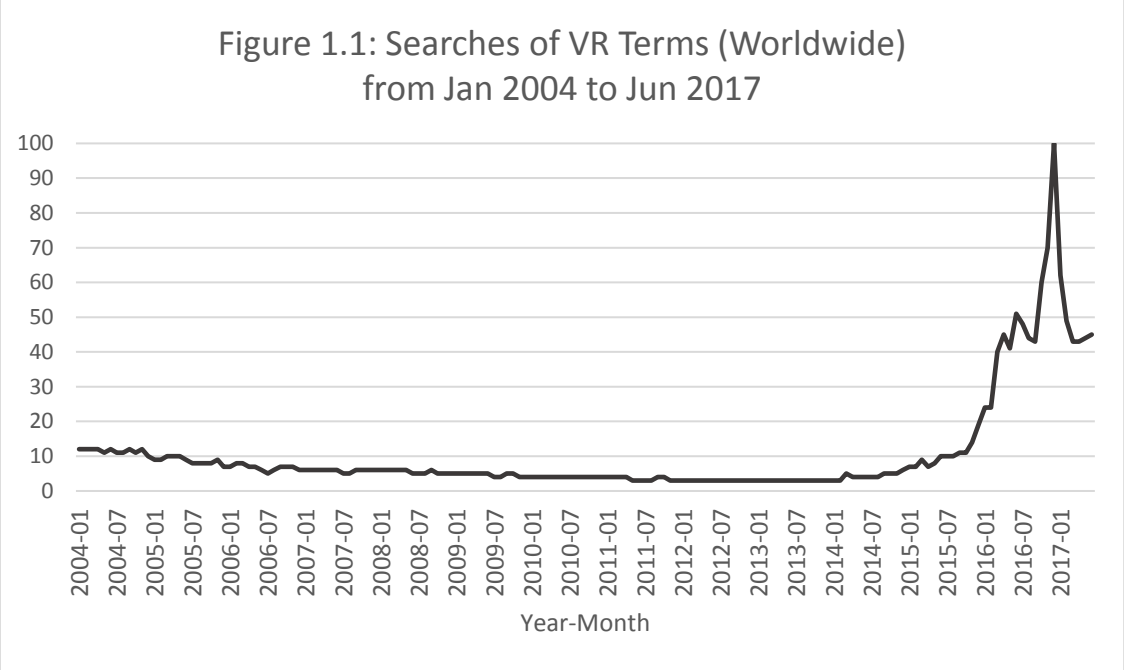
These set-up costs may not represent the actual cost to the consumer if they already own some of the components needed to use the HMD. Similarly, bundled versions of these products (i.e. the HMD plus the power source and/or controller) would not cost as much as the totals shown here. On the other hand, set-up costs could be much higher if consumers want to get an optimised VR experience, such as buying an improved controller or a PC with higher specifications. Nevertheless, this breakdown gives some idea as to the prices of each VR experience.

Though some of these prices may seem high, they are much lower than the costs of early VR devices. For instance, Rheingold (1991) states that as of 1990, it cost (at the least) $115,400 for a VR set-up for one person. With this price in mind, it is clear that a fully immersive VR experience was far from consumer-ready at that time. The current VR experiences are now much more affordable than early VR set-ups, which is partly why they are now viable consumer products.

Moreover, although VR was not as successful as expected during the so-called year of virtual reality (SuperData, 2016), it still generated significant revenue. SuperData and Unity (2017) reported that the total revenue from VR in 2016 was $1.8 billion. The report also shows a breakdown of how many units of each device were shipped throughout 2016. Despite being known as the device that started this trend, Oculus Rift shipped the least units (0.24 million) out of both mobile and dedicated devices. PlayStation VR shipped the most units out of dedicated VR devices (0.75 million), much more than HTC Vive in second-place with 0.42 million shipped units. Samsung shipped monumentally more Gear VR headsets than any other device, at 4.51 million units. However, SuperData and Unity (2017: 16) note that this is due to "giving away hundreds of thousands of headsets" with pre-orders of Samsung's latest smartphone. The report does not include Cardboard (as it was not released in 2016), though it states Daydream View shipped 0.26 million units in 2016. Although this is a low number, it must be noted that this device had only been on sale for just over one month of 2016 after its release on 10 November, meaning it did not have as much time to sell as other devices. Regarding Cardboard, Google stated the device had been shipped over 10 million times as of the end of February 2017 (Singh, 2017). Whether VR revenue is lower than expected or not, these figures show that a significant number of consumers have tried or are using these new VR devices.

Public and Media Interest of VR

Furthermore, this trend of HMDs has caused a large increase in public and media interest in VR. Figure 1.1 shows a screenshot from Google Trends which measures how often people have used the Google search engine to search for a term or topic. In this case, Figure 1.1 shows the number of times people searched for VR-related terms from 2004 onwards. As shown, the number of searches of VR-related terms increased quite sharply between 2015 and 2016 and was at its highest point at the end of 2016. It cannot be a coincidence that this occurred around the releases of these new VR devices.

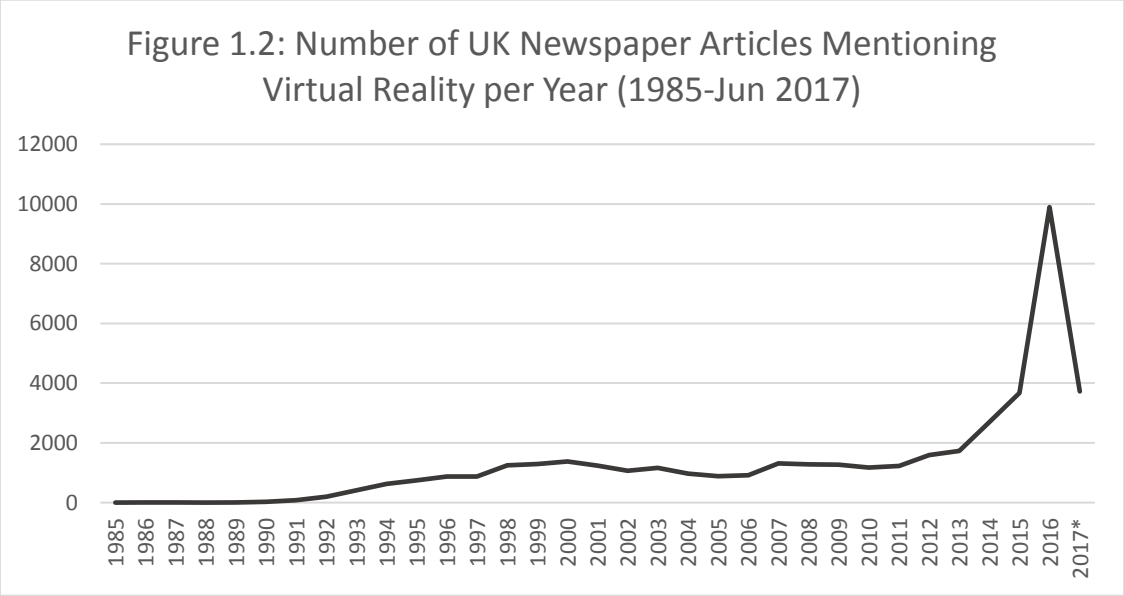


Source: Google Trends (n.d.).

Note: "Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular" (Google Trends, n.d.).

Moreover, a similar trend can be seen in press coverage of VR. Figure 1.2 shows the number of UK newspapers mentioning 'virtual reality' anywhere within the article according to the LexisNexis database. As shown, since Oculus Rift's Kickstarter campaign in 2012, the number of news articles has increased year-on-year. The increase

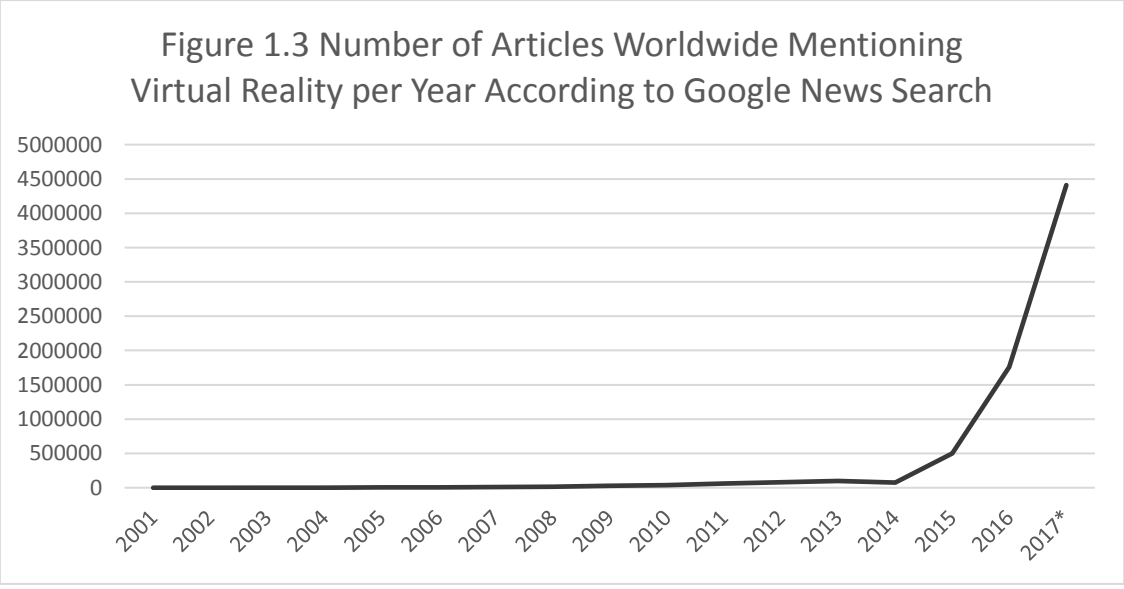
between 2015 and 2016 was very large, which suggests the various VR devices released throughout 2016 may be the main contributing factor to increased media attention.



*from 1 January 2017 to 22 June 2017

Source: Search results for the term 'virtual reality' on LexisNexis.

Similarly, Figure 1.3 shows the number of online news articles worldwide mentioning 'virtual reality' according to Google News searches. This shows a similar trend as Figure 1.2, with the number of articles dramatically increasing since 2014. Examining these trends of VR Internet searches and published news articles suggests the new HMDs have caused a surge in both public and media interest of VR. Therefore, it is important to analyse news coverage of VR during these periods to understand how news media are representing VR to the public who appear to have taken an interest in it.



*from 1 January 2017 to 22 June 2017.

Source: Search for the term 'virtual reality' on Google News.

Positioning the Thesis

As with any emerging technology, it is important to research VR's news representations because news may be the first (and perhaps only) source of information the general public have about these technologies (Williams, 2003; Whitton and Maclure, 2015). This puts journalists in a powerful position as their discourse can have a strong impact on public opinion of these technologies. The media has the power to create very negative perceptions of a new technology by focusing on its negative aspects (such as risks), or very positive perceptions by focusing on its positive aspects (such as benefits). In turn, this can affect the success or failure of a new innovation because news readers may be encouraged or discouraged to invest in the product (Druckman and Bolsen, 2011). Furthermore, there is evidence to suggest news discourse can impact future legislation of a new technology (Marwick, 2008; Rogers, 2013). Therefore, researching news representations of VR can bring to light news media's influence upon each of these outcomes.

This study makes an original contribution to research in several ways. Firstly, although researchers have examined news portrayals of videogames (VR's main application) (see Williams, 2003; Rogers, 2013; Whitton and Maclure, 2015) and other emerging technologies (see Lewenstein, Gorss and Radin, 2005; Weaver, Lively and Bimber, 2009; Allan, Anderson and Peterson, 2010; Cacciatore et al, 2012), nothing has been published that analyses news representations of VR. Therefore, this research provides insight into an area which has not yet been addressed in the existing literature. Secondly, the sample size of the current study is large and consists of articles from a wide range of news sources (from UK and US publishers in both online and print formats). This differs from existing studies of other emerging technologies (see, for example, Williams, 2003; Lewenstein, Gorss and Radin, 2005) and allows for a broad analysis of VR news discourse, which increases the accuracy of the results. Thirdly,

unlike most previous research of emerging technologies, this study combines Content and Discourse Analysis for a thorough mixed methods approach, which provides valuable quantitative as well as qualitative insights into news portrayals of VR.

Considering the lack of research about news representations of VR, the overall research question was simply: How is VR represented in the news? The hypotheses for this question is detailed below alongside the two sub-questions and their corresponding hypotheses. Each of these hypotheses are based on the characteristics of different VR devices detailed in this chapter as well as other existing literature, which will be discussed in Chapter 2.

RQ1: How is VR represented in the news?

H1: VR will be portrayed more positively than negatively.

H2: Immersion will be a strong theme in the discourse.

SQ1: What differences are there between representations of each VR device?

H1.1: Mobile VR devices will be portrayed more positively than dedicated VR devices in terms of price.

H1.2: Dedicated VR devices will be portrayed more positively in terms of quality than mobile VR devices.

SQ2: Do different publication types (e.g. generalised, specialised) represent VR differently?

H2.1: Technology-specific news outlets will be more positive about VR than general news outlets.

H2.2: General news outlets (particularly print newspapers) will focus on negative aspects of VR, such as risks, more so than specialised news outlets.

Thesis Structure

This chapter has provided an overview of the topic of this thesis, including the background of VR and VR devices, the originality of the project and the importance of studying news representations of VR.

The next chapter reviews the existing literature related to the current study, split into two parts. The first part of Chapter 2 discusses relevant media theories, including news sources and primary definers, framing, hype and moral panics as well as VR theories related to immersion and presence, transcendence, escapism and VR concerns. These theoretical concepts are then linked to part two which focuses on previous research related to this study, including fictional representations of VR and news representations of videogames and other emerging technologies. These ideas help to situate the project and justify the methodology.

Chapter 3 then details the research process, methodology and sampling strategies used in this project. As the largest part of this thesis, Chapter 4 discusses the findings from the study, organised into three sections: the VR news landscape, positive representations of VR and negative representations of VR. Finally, the thesis will be brought to a close with Chapter 5, which will provide a summary of the study: its findings, impact and areas for future research.

Chapter 2: Literature Review

It is important to discuss the theoretical concepts relating to VR to identify the extent to which these notions may be reproduced in news discourse. Therefore, the first part of this chapter outlines some theoretical concepts related to VR that will be considered throughout the study. Similarly, the second part of this chapter examines some media theories relating to studying representations in the news. Additionally, in order to have a better understanding where the project sits in relation to existing research, the third part of this chapter critically examines previous studies of VR devices, VR in general and other wearable and emerging technologies.

Virtual Reality

Immersion and Presence

According to Sherman and Judkins, "[v]irtual reality uses all your concentration, and fills all your senses" (1993: 157, emphasis in original). Here, it appears the authors are referring to what Davis, Bryla and Benton (2015) state are the two key words to describe VR: immersion and presence. The authors distinguish the two terms as follows:

> Immersion is the art and technology of surrounding the user with a virtual context, such that there's world above, below, and all around you.
>
> Presence is the visceral reaction to a convincing immersion experience. It's when immersion is so good that the body reacts instinctively to the virtual world as though it's the real one.
>
> When you turn your head to look up at the attacking enemy bombers, that's immersion; when you can't stop yourself from ducking as they roar by overhead, that's presence (2015: 5, emphasis in original).

These feelings of immersion and presence are achieved by making the virtual environment feel as real as possible (Davis, Bryla and Benton, 2015). Modern VR devices attempt this by "blocking out the real environment" with the use of an HMD that has a wide field of view (Davis, Bryla and Benton, 2015: 17). Thus, the viewer can no longer see the physical world.

Additionally, the sense of immersion and presence is improved if users are able to move around, and interact with, the virtual environment in a way that feels natural. Even in the early stages of VR, Rheingold (1991) and Sherman and Judkins (1993) highlighted that the interactive aspect of VR can improve immersion. For example, Sherman and Judkins (1993: 159) pointed out that "[VR] absorbs (or immerses) users in a different, vivid world. […] But on top of all this it is interactive. You, the user, will be part of the world". In other words, this interaction allows the user to feel as if they are in the virtual world. The use of a controller is one way this is made possible (Rheingold, 1991).

With immersion being a focal aspect of VR, it is unsurprising that this is also a strong theme in VR marketing. Modern VR companies tend to promote their devices by highlighting their immersive potential. For example, a video advertisement for Samsung Gear VR shows an ostrich using a flying simulator on the device. The effect of immersion is so strong that the ostrich ends up thinking he can really fly (Samsung Mobile, 2017). Similarly, Oculus Rift's product page on Oculus' website (during the time of the device's US release) strongly focused on immersion with the following descriptions of VR:

> Whether you're stepping into your favorite game, watching an immersive VR movie, jumping to a destination on the other side of the world, or just spending time with friends in VR, you'll feel like you're really there.
>
> […]

> Rift's advanced display technology combined with its precise, low-latency constellation tracking system enables the sensation of presence – the feeling as though you're actually there. The magic of presence changes everything. You've never experienced immersion like this (Oculus, n.d.).

Suggesting VR allows the user to "step in" to a game or "jump" to a different destination highlights VR's immersive capabilities. This is enhanced by the statement "you'll feel like you're really there" and is reiterated in the second paragraph from the angle of presence. Finally, "you've never experienced immersion like this" suggests VR is strongly immersive in a way that is unlike any other immersive experience. With immersion being such a prominent theme in VR marketing and literature (as will be discussed shortly (see Taylor, 1997; Lonsway, 2002; Fisher, 2011)), it is worthwhile examining the extent to which this characteristic also appears in news coverage of VR.

Transcendence

In a different way to immersion and presence, VR allows its users to transcend the limitations of the real world (Biocca and Levy, 1995). According to Blascovich and Bailenson (2011: 23), humanity has long-sought experiences that are 'better' than the real world: "Stray thoughts, dreams, chemical influences, or religious beliefs all point to an inherent human need and desire to transcend reality 'as we know it'". Modern VR is perhaps the most powerful tool currently available which allows its users to achieve this transcendence. Indeed, a VR user can be almost anything, anyone and anywhere they may or may not want to be within the virtual environment. For instance, in his debut interview about VR, Jaron Lanier described the different forms a user's virtual body can take: "[your body] might be human or might be something quite different. You might very well be a mountain range or a galaxy or a pebble on the floor" (quoted in Zhai,

1998: 177). These experiences are only possible in the virtual world and therefore demonstrate VR's transcendent capabilities.

More basically, one of the simplest forms of VR transcendence is that users are able to "reach out and touch others who are not physically co-present" (Chan, 2014: 76). This transcends the physical boundaries of space and time. On the other end of the scale, there are also predictions that VR could one day allow immortality by 'uploading' one's mind into the virtual world where it could 'live on' for eternity (Lanier, quoted in Zhai, 1998; Steinicke, 2016). Though not currently possible, this is perhaps the height of transcendence as it escapes all laws of the physical world by creating eternal life in a virtual form. As will be highlighted later in this chapter, fictional representations of VR show the technology to have transcendent capabilities (Chan, 2014). Therefore, the transcendence theme will be measured in news articles of VR for the current study.

Escapism and Addiction

This transcendence links to escapism. Tuan (1998: 113) suggests escapism is a tool used to transport oneself to "a better life and a better place". Escapism is also transcendent because it leaves behind the undesirable parts of the 'real' world for a better and improved virtual world. In relation to cyberpunk, this was often called 'beating the meat' of the physical body (see Sobchack, 1995; Butler, 2010). Moreover, escapism is usually viewed negatively as it is "an avoidance of the 'real'" (Calleja, 2010: 335).

Escapism can take many forms, but in particular Evans (2001: 109) highlights that "[t]he arts and the media are potent hotbeds of escapism". Furthermore, Evans argues that there are different types of escapist activities. He classes playing videogames as an active escapist activity, whereas watching films or TV and reading books are passive escapist activities. This is because of the interactive element of

videogames – the user is moving around the videogame environment and interacting with it. Since the main commercial application of VR is videogames (which become more interactive within immersive VR), VR is perhaps currently the most active form of escapism.

Despite this, some creators of VR technologies and VR content state VR was not intended to be used in this way. Lanier himself (who coined the term 'virtual reality' and created some of the first VR technologies) highlighted: "When my friends and I built the first virtual reality machines, the whole point was to make this world more creative, expressive, empathic, and interesting. It was not to escape it" (2011: 33, emphasis added). Similarly, in the preface of Davis, Bryla and Benton's book (2015: xx) about creating VR applications, Alex Benton had a similar outlook: "I want to put people into virtual worlds that train them to expect more from the real one". With this in mind, seeing whether VR is represented as escapist in the news will demonstrate which side the press support.

In addition to escapism often being viewed negatively, there have been concerns over escapism causing addiction. For instance, Tuan (1998: 66) highlighted that daydreaming (a form of escapism) can become addictive: "One learns to be not just an occasional visitor but the habitué [resident] of a fantasy world". More specifically to media, Fulford very cynically detailed the issues of escapism and addiction:

> The fact is we live in a society where most people spend most of their unallocated time engaged with various forms of escapist activities. Mass entertainment promotes disengagement with people and society, and seduces a person into spending time and money experiencing 'virtual' things – video games, soap operas, game shows. Escapism – at its worst a means of building addictive behaviours for the creation of profit – is strenuously encouraged in our society (quoted in Evans, 2001: 229).

Fulford shows concern not only over the addictive qualities of escapism, but that the mass media encourage this escapism in order to generate profits. Due to the immersive capabilities of VR, it is possible this technology could be even more addictive than other media forms (Blascovich and Bailenson, 2011). Blascovich and Bailenson even argue that this could cause its users to withdraw from society. Whether these statements are true or not, they highlight the potential for fears of VR being an escapist activity by linking it to addiction which may appear in news coverage of VR. Therefore, it is important to analyse the sample of the current study to uncover whether these or similar fears are present within the discourse.

VR Concerns

As well as there being concerns over the potential for VR addiction, other issues raised in the literature include VR sickness and Alternate World Syndrome (AWS). Both Ryan (2015) and Davis, Bryla and Benton (2015) highlight the potential for VR to cause motion sickness, and there are many studies that look at how this can be reduced (see Steinicke and Bruder, 2014; Chardonnet, Mirzaei and Mérienne, 2017 and Lee, Kim and Kim, 2017). This sickness within VR is a result of immersion – the brain believes what the user is seeing in VR is real, but because the user's physical body is not moving in the same way as the virtual one, a conflict between the senses causes sickness (Howarth and Costello, 1997). As a result, users may experience symptoms such as "headache, drowsiness, nausea, dizziness, vomiting, sweating, eyestrain, neck strain, and fatigue" (Davis, Bryla and Benton, 2015: 256). According to Davis, Nesbitt and Nalivaiko (2015), this VR sickness is a major obstacle to widespread adoption of VR. Therefore, if the media emphasise this issue, it may negatively impact the success of VR devices.

Linked to VR sickness, Heim (1993) claims VR can cause AWS, which (as with VR sickness) is a result of a conflict between the virtual body and the physical body. He likens AWS to jet lag and states that "AWS occurs when the virtual world later obtrudes on the user's experience of the actual world, or vice versa" (Heim, 1997: 422). To expand, Heim uses the example of a scientist at NASA, explaining that:

> [H]is work in VR often has him unconsciously gesturing in the primary world in ways that function in the real world. He points a finger half expecting to fly (as his cyberbody does under the conventions of the virtual world). His biobody needs to recalibrate to the primary world (Heim, 1993: 422).

The VR user has learned to interact with the real world differently (and not effectively) because of time spent in the virtual world – this is AWS.

In simpler terms, Sherman and Judkins (1993: 201) describe a similar issue called the 're-entry problem', which is "an inability to cope with the real world after a spell in a virtual one". It is not only important to measure whether these issues appear in news coverage of VR but also to consider the effect not mentioning this could have on public perception of VR. If the news media do not highlight the risks of VR, the public may be more likely to have a positive view of the technology. With this in mind, various theories and practices surrounding news discourse will now be examined.

News Media: Theories and Practices

News Sources and Primary Definers

The news media are not creators of news items per se, but instead create a story about a certain topic that has been brought to their attention (Hall et al, 1978). Journalists are informed by 'primary definers' of a topic and themselves become 'secondary definers' (Baden and Tenenboim-Weinblatt, 2016). This primary definer is

able to "establish the initial definition or primary interpretation of the topic in question" (Hall et al, 1978: 58, emphasis in original). The media as secondary definers "reproduce the definitions of primary definers", sometimes 'translating' official statements into language that can be understood by its audiences (Critcher, 2003: 134; see also Ingraham and Reeves, 2016; Anstead and Chadwick, 2017). Therefore, by relying on primary definers, journalists determine the shape of their reports and the sources that underpin and give credibility to them.

Primary definers are usually accredited sources for the relevant topic (Hall et al, 1978; Ingraham and Reeves, 2016; Anstead and Chadwick, 2017). In other words, their statements should hold value because of who they are, what they do or where they are from. For instance, a technology analyst would be considered an accredited source for predictions about technological trends. Similarly, the creator of Oculus Rift, Palmer Luckey, would be considered an expert in VR and thus, an accredited source on the topic.

Once journalists have established a certain source, they may be likely to use that source repeatedly to save time when writing further news articles (Berkowitz, 2009). This means there is the risk of some sources monopolising the news coverage of a certain topic, allowing them to shape news discourse and, as a result, public opinions and attitudes (Berkowitz, 2009). Frequent citation of organisations and businesses in the news in a positive light helps to maintain public interest and/or favourability of them (Berkowitz, 2009), which, in turn, could contribute to their success. Therefore, news companies supporting such businesses would likely make them primary definers of topics that can contribute to their success. On the other hand, news outlets with an oppositional agenda to the businesses would be less likely to make them primary definers.

In this way, it is important to analyse whose voices are heard within news discourse as this "is to reflect on who has social power and who does not" (Cottle, 2000, cited in Franklin and Carlson, 2011: 1). Since "to be a news source is to have the power to define the world" (Franklin and Carlson, 2011: 2), analysing whose voices are heard within the news brings to light which people or groups the press favour and which they do not.

Framing

In a similar way, framing theory can be used to uncover power relations and imbalances within news articles. Entman describes framing as follows:

> To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described (1993: 52, emphasis in original).

In other words, framing is used to make some parts of reality more prominent than others, thus highlighting some aspects and de-emphasising others. Therefore, analysing these frames can help "to describe the power of a communicating text" (Entman, 1993: 51). Indeed, Druckman states that "any group wishing to push an agenda […] frames the relevant issue in a way that advances its cause" (foreword in D'Angelo and Kuypers, 2010: xiii). The author continues to highlight the power these frames have: "Not only do they shape what others think of an issue […] but also how they understand and discuss the world around them" (2010: xiv).

Similarly, in relation to new technologies, Vishwanath (2009: 201) states framing is a "simple, subtle, and effective way of influencing adoption". Therefore, measuring media frames is vital to understand the power of the media in creating and influencing public opinion. This is particularly true for new technologies such as VR

because readers may have little existing knowledge of them before reading about them in the news (Lewenstein, Gorss and Radin, 2005; Allan, Anderson and Peterson, 2010). Analysing frames within the current study will highlight which aspects of VR the news make the most salient.

Hype

Various authors suggest that media representations of different types of new media are similar in the way that they are initially positive and become more negative over time (Cacciatore et al, 2012; Fox, 2013). For example, Fox (2013: 306) states: "Cycles of hype and disappointment are frequently observed in relation to new technologies". This links to the Gartner Hype Cycle, which suggests that every innovation follows a similar cycle of hype, from its inception to either mainstream adoption or obsolescence (Fenn and Raskino, 2008). As shown in Figure 2.1, the Hype Cycle begins with the first announcement (or 'trigger') of a technology, closely followed by a 'peak of inflated expectations' (Gartner, n.d.). This is followed by a 'trough of disillusionment' when these expectations are not met. Then, these expectations – and thus, hype – slowly rise again until levelling out over time.

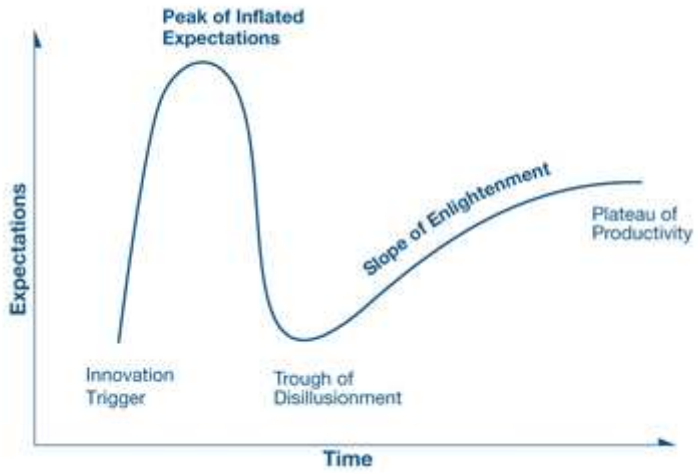


Figure 2.1: Gartner's Hype Cycle.
Source: Gartner (n.d.).

Fox (2013: 306) argues that "[h]ype draws attention to potential positive effects while excluding or under emphasizing a new technology's dependencies on other factors and its potential negative effects". In this way, the use of hype within media can contribute to framing a technology so that negative aspects are ignored or glossed over.

Hype can be measured in several ways, though the most common approaches are to measure the frequency of press coverage relating to a topic as well as analysing the popular sentiments within this discourse (Bakker, 2010). For instance, Ruef and Markard (2010) measured hype and disappointment of stationary fuel cells within German-language newspapers. The authors searched the German term for fuel cells ('Brennstoffzelle') within these publications and recorded how often it appeared from 1993 to 2007. This frequency analysis, combined with a Discourse Analysis of a portion of the articles, allowed authors to identify periods of hype and disappointment within the press. Ruef and Markard's results did not entirely confirm the hype cycle. Though they identified a period of hype and a period of disillusionment, they stress that framing of fuel cells remained positive over time. In this way, the hype cycle may not correspond to every new technology – VR included. However, this gives some idea as to how hype of VR could be measured within the current study.

Since the emergence of Gartner's Hype Cycle, the company has released yearly Hype Cycle reports detailing where various new technologies are situated on the Cycle for that time period. According to a press release about Gartner's 2016 report, as of July 2016, VR was at the beginning of the 'slope of enlightenment' stage of the Hype Cycle (Gartner, 2016). This means hype surrounding VR should now be gradually increasing after the 'trough of disillusionment'. Unfortunately, the press release does not provide any methodological information about this result and the full report is only available to Gartner members, making it unclear how the company came to this conclusion.

However, similar ideas have been put forward elsewhere. Gruenbaum (2015: 256) argues that virtual worlds "have been languishing in the trough of disillusionment since passing the peak of inflated expectations in 2007". Since virtual worlds or environments are specifically what VR creates, this statement may have relevance to VR as well. It is significant that this statement was published in 2015, because the Gartner report in 2016 situates VR further along in the Hype Cycle than Gruenbaum. It is perhaps the case that between the writing of Gruenbaum's book and the 2016 Gartner report, VR has moved out of the 'trough of disillusionment' (that Gruenbaum argues virtual worlds were in as of 2015) and onto the slope of enlightenment, as suggested by Gartner in 2016. Therefore, both of these statements suggest news coverage of VR may be becoming more positive over time, though not as strongly positive as it would have been during the earlier stages of VR technology.

To uncover whether this is accurate for the sample of the current study, possible hype and disappointment will be analysed by searching for positive and negative sentiments within articles as well as taking into consideration the volume of articles about VR devices. For instance, a large number of positive words/themes may mean VR is near the peak of expectations and a large number of negative words/themes may mean VR is nearer the trough of disillusionment.

Moral Panics

On the opposite side of generating hype is the moral panic. A phenomenon named by Stanley Cohen, a moral panic is created when the media construct exaggerated news stories that produce fear amongst the general public (Cohen, 2002). This usually occurs as a result of seeking a scapegoat for a distressing social issue, such as blaming violent media for real-life crime and violence (Coulson and Ferguson, 2016). Various topics have been the focus of moral panics over the years, from benefit

cheats to migration to child abuse (Cohen, 2002). Importantly, Cohen states that "[c]alling something a 'moral panic' does not imply that this something does not exist" (2002: vii). Indeed, the previous examples of moral panics are, or have been, real issues. Rather, "the moral panic label means that the 'thing's' extent and significance has been exaggerated" (2002: vii). This is important to keep in mind when analysing whether a moral panic about VR is being created by the press.

Cohen highlights one moral panic that is particularly relevant to the study of VR – harmful effects of media exposure. He states: "There is a long history of moral panics about the alleged harmful effects of exposure to popular media and cultural forms" (2002: xix) and these become 'media panics'. An example of this is linking media violence to real-life violence. According to Cohen, these media panics are created as a reaction to any new medium. Indeed, Krinsky (2013: 157) states "new entertainment and information media have repeatedly been met with moral panics over their corrupting influences […] as well as on their disruptive consequences for society". For instance, Ferguson (2008) highlights that the moral panic surrounding videogames became prominent after the perpetrators of several school shootings were found to play videogames. Moreover, Whitton and Maclure (2015) suggest the negative news representations of videogames are part of a much broader idea of technology as evil. If these statements true, VR should experience its own media panic within news discourse.

Ferguson (2008) suggests one reason for the creation of moral panics could be that negative news stories sell better than positive news stories. Therefore, being able to create and maintain a moral panic could generate more profits. This sentiment is shared by Porter (2015) and by Denham (2013: 329), who states that "drug-related moral panics sell newspapers and increase television ratings". If this is the case, the media may create a moral panic about VR to increase profits for the media organisation.

More specifically to technology, Marwick (2008) defined moral panics relating to contemporary technology as 'technopanics'. According to Marwick, technopanics have three notable characteristics: they focus on new media, they frame children's use of new media as abnormal or unhealthy, and this is used to influence regulation of new media content. Marwick highlights two examples – cyberporn and online predators on the social networking site MySpace – which resulted in restricting online content because of the technopanic that was created by the media. This indicates the effect that creating moral panics of technology can have and thus, the importance of researching whether a moral panic is emerging within discourse of new media, including VR.

Representations of VR: Existing Studies

The remainder of this chapter discusses the existing research related to the current study, including unpublished projects analysing news representations of VR devices, VR portrayals in fiction and news coverage of videogames and other emerging technologies.

VR Head-Mounted Displays (HMDs)

Perhaps because VR devices are so new, no peer-reviewed academic research has yet been published on news media representations of them. However, there are unpublished studies that provide insight into the possible trends that may appear within the current project.

As a preliminary study to the topic of this thesis, my own previous research into representations of Oculus Rift in online news media is relevant to the current project. Using Content and Discourse Analysis, this study found Oculus Rift to be represented overwhelmingly positively in the majority of coverage, with some articles even implying the VR experience is superior to real life (Graves, 2016). Key themes included

representing the device as positive in the way that it is immersive, revolutionary, social and high quality technology with a broad range of capabilities. There were also some negative representations, however, these were usually focused on aspects other than VR itself, such as the price of Oculus Rift and its marketing strategy.

Although this research provides a starting point as to representations of VR in news media, it is very limited in its scope. The project consisted of just 58 online articles across a three-week period and only focused on one VR device. Therefore, these results may only be relevant to online news of Oculus Rift specifically, rather than VR devices across a range of news media. These drawbacks highlight the gap that is still present in this field, which this thesis aims to fill.

Another relevant (though also unpublished) study comes from Baumann (2016). Although not solely focused on representations of VR devices, Baumann's Masters thesis analysed how wearable devices (including VR HMDs) were framed across six popular newspapers in the US, from 1988 to 2016. According to Baumann, the majority of articles in her sample focused on VR HMDs, meaning these findings may be similar to those of the current study that focuses on HMDs specifically.

Baumann used four 'issue frames' identified by Weaver, Lively, and Bimber (2009) to analyse her sample. She found wearable technologies were most frequently framed in relation to progress (60.4%). This frame included information about product features and potential uses. Baumann also highlighted that there were a large number of articles focusing on product reviews, which was also a trend in the Oculus Rift study (Graves, 2016). On the other hand, wearable technologies were mentioned the least in terms of regulation (5%), which coincides with research findings on other emerging technologies (such as nanotechnology) that will be discussed further on in this chapter.

Although Baumann's study is the most relevant to the current research, making it a useful tool for comparison, it is important to keep in mind that this paper is an

unpublished thesis. The fact that it is unpublished means that it has not been peer reviewed and may therefore not be a solid and reliable source. Despite this, with such a limited amount of research available in this area, it will still be beneficial to compare these findings to the current study.

Virtual Reality

Apart from these two projects, no other known research focuses on news representations of the current VR devices. Because of this, it is useful to understand what research has been done in the wider area related to the topic – in this case, representations of VR more generally. Little research has been carried out in this area as well. What has been done focuses mainly on fictional representations of VR, such as in novels and films, rather than the news representations on which this project focuses. However, some of the results from studies on fictional representations of VR can be seen to coincide with the results from the preliminary study on Oculus Rift, meaning they will also be useful to compare to the current study.

The earliest example of VR in fiction was Daniel Galouye's 1964 novel Simulacron-3, derived from the term 'simulacrum' which means an imitation of the original (Steinicke, 2016). Since then, VR has been a common theme in fictional media, particularly cyberpunk films and science fiction novels (Steinicke, 2016). It is no surprise, then, that media representations of VR within fiction have been researched more so than the recently available VR devices.

The most extensive study on this topic is Chan's book (2014) VR: Representations in Contemporary Media. Her analysis included popular novels and films, including James Cameron's Avatar (2009) and William Gibson's Neuromancer (1984). Throughout her research, Chan uncovered overwhelmingly positive representations of VR, claiming that a major theme was representing VR as a way to

transcend the limitations of the physical body. It appears that the theme of transcendence is common in representations of VR. Taylor (1997: 174) also suggests that in many popular media, VR is portrayed "as a transcendent technology, in which the body and materiality itself are left behind and the user becomes one with a virtual technological whole". Taylor's statement not only highlights the common transcendence theme, but also encompasses another popular theme in VR fiction – transportation. The statement "[t]he body and materiality itself are left behind" suggests the VR user to travel somewhere other than reality. This idea of being transported links to the notion of VR being immersive as the user actually feels they are in another place.

Indeed, another common way for VR to be represented in fiction is through its ability to transport the user from the real to the virtual world. For example, Lonsway suggests that most cultural representations of VR focus on this transportation:

> [P]roduct advertising promotes the ability of users to leave their real environments and enter fantastic ones with the aid of certain devices […] and popular fiction invents myriad mechanisms and devices which provide novel ways to travel from reality into cyberspace (Lonsway, 2002: 62, emphasis in original).

Here, Lonsway suggests particular emphasis is put on the difference between the real and the virtual world, rather than suggesting they are one in the same. Fisher (2011: 57) shares this sentiment, stating that "[r]epresentations of VR within contemporary science fiction films have focused considerable resources, in terms of special effects, on rendering the boundary between real and virtual worlds". It appears that this idea of transportation is often accompanied by an emphasis on the differences between the real and virtual spaces.

On the other hand, some authors argue that modern representations differ from this. For example, O'Riordan (2005: 141) agrees that early representations of VR

"maintain a cyberspace/actual space divide, which separates out a technologized space from a 'natural' social space". However, O'Riordan goes on to say that, in more current representations of cyberspace, "the need to represent virtual space as embedded in, and part of, the fabric of everyday life, has become a more acute problem for science fiction genres" (2005: 141). In this way, O'Riordan suggests that representations of VR in fiction have now started to avoid emphasising the difference between the real and the virtual but, rather, are trying to make VR seem embedded in reality.

More recently, Jones (2016) also highlights similar findings, with particular emphasis on the film franchise Resident Evil (2002-2012). Jones points out that "films depicting computer simulations of space imply a dichotomy between the immaterial, ephemeral and dreamlike space of virtuality and the (seemingly) concrete real world" (2016: 480). However, he suggests one exception to this trend is the Resident Evil franchise. According to Jones, the real and the virtual worlds are shown to be interlinked by making the "abstract map and the lived territory" appear to be interchangeable (2016: 481). In other words, the Resident Evil franchise focuses on the similarities between the two states (the real and the virtual) rather than the separation of the two, which makes the virtual world appear embedded in the real.

In a different way, Flanagan (2014) focuses on representations of VR in contemporary novels for young adults. Flanagan highlights that "VR is presented as a very 'real' space for the acting out of identity development and peer relationships" (2014: 156). In other words, VR in these novels is represented as a very social space, which shows continuity with the study on news representations of Oculus Rift. It may therefore be likely to see similar findings in the current project.

In more detail, Flanagan claims: "Such fictions depict cyberspace as collective, heterogeneous and empowering for adolescent subjects and demonstrate that many of the rites of passage associated with the transition from adolescence to adulthood are

now being played out in VR" (2014: 156). In this way, Flanagan suggests VR in young adult fiction to be represented as very important to the lives and development of adolescents. It remains to be seen whether this will be a similar theme for news media portrayals of VR. For, as we will now see below, the main application of modern VR has been represented in the opposite way.

Videogames

According to Shaev (2015: 17), "video games and computer communications using multimedia technology [have] become almost the most iconic representations of VR". In addition, videogames are the main application of fully immersive VR devices (Steinicke, 2016) so it is possible that there may be similarities in their representations. However, current research shows that, in contrast to the positive framing of VR discussed above, videogames are frequently represented negatively. This is normally in terms of their relation to addiction, violence, causing physical ailments and encouraging isolation, which creates a moral panic surrounding videogames. Considering the strong link between VR devices and videogames, it is useful to compare findings from these studies to the current project, particularly if, as these authors argue below, representations of each new media technology are similar.

Williams (2003: 524) claims that "[u]nderstanding these representations [of videogames] tells us not just about the particular technology in question, but about how we look at all new media technologies". More specifically, Williams suggests discourses on other new media have been both utopian and dystopian, often contradicting each other. He goes on to say that utopian frames often focus on how new media technologies can provide a way to transcend nature in a positive light (linking to representations of VR in fiction) as well as making daily life more convenient. By making these connections, it appears there are similarities in the way different related

technologies are represented. This demonstrates the benefit of examining portrayals in other areas related to VR devices.

Indeed, Williams' research findings mirrored this general trend. Williams' study involved a Content Analysis of the way the media framed videogame technology across thirty years – from 1970 to 2000 – in three US magazines (Time, Newsweek and US News & World Report). He discovered both utopian and dystopian frames, which, as he predicted above, contradicted each other. For example, videogames were portrayed as educational and able to improve skills, but also as a health risk and related to drugs and addiction. It is clear that, as is popular with other new media technologies, both positive and negative views contradict each other in this study.

One particularly relevant frame Williams uncovered was the concern over "the inability of children to distinguish between fantasy and reality" (2003: 542). This is an important finding in relation to the current study since playing videogames on VR devices is much more immersive than the videogames in Williams' study. If Williams' analysis is accurate, it may be likely that there will be similar, and possibly even stronger, fears surrounding the blurring of reality and the virtual in the news representations of VR devices. Williams' study provides insight into a very under-saturated field – the representations of videogames in the news – making his work a valuable tool for comparison to future related studies.

In a similar project, Rogers (2013) examined fears expressed by the popular press regarding early videogame technology between 1972 and 1985. Rather than only focusing on magazines as Williams did, this study focused on major newspapers, magazines and news broadcasts in the US. Rogers identified four main frames in his sample. These were fears regarding: physical ailments (e.g. repetitive strain injury); addiction (e.g. videogame players compared to drug addicts); the dangers of videogame lifestyle (e.g. isolation and antisocial behaviour); and videogames' link to violence (e.g.

desensitisation towards violence). In relation to addiction, Rogers states that many articles used quotes from a figure of medical authority which made the statements hold more weight with readers. This highlights the importance of profiling who is quoted within articles in the current project to judge how influential these representations may be.

Furthermore, Rogers' sample suggested that videogame violence was more concerning than violence in other media (e.g. film) because of the element of interactivity in gaming. If this is a true depiction of the news framing at that time, it is possible that news representations of VR devices will be even more averse to violence since the level of interactivity in fully-immersive VR is much higher than the traditional videogames Rogers' sample referred to. On the other hand, the representation of videogames as isolating contrasts with those of Oculus Rift in the above study, as well as VR portrayals in Flanagan's (2014) study as very social.

Rogers compared these initial findings to contemporary fears surrounding videogames. These findings may be more relevant to the current study since it focuses on a more recent time period. According to Rogers, fears about physical ailments still persisted in contemporary coverage but changed focus to other risks such as causing obesity. Additionally, videogame addiction fears were still present but were not as frequent as they were in older coverage. On the other hand, videogames' link to violence was the most prevalent frame in contemporary coverage, with "by far the highest frequency" (Rogers, 2013) and occurred much more often than it did in older coverage. This further suggests news media coverage of VR devices may show concern over violent videogame play.

Interestingly, Rogers also notes that "many of the frames identified in this paper were directly refuted by news sources specializing in video games". This highlights the

benefit of including both general and specialist publishers in the current study to uncover whether the two groups differ in their representations of VR devices.

Although this study gives some indication as to news media framing of fears surrounding videogames, it is precisely limited to framing of fears rather than more general news representations. However, that this study has focused on fears regarding videogames rather than another angle does suggest that the press may more frequently mention videogames in relation to their negative impacts rather than their positive ones.

Indeed, Whitton and Maclure's (2015) research shows just that, by applying Discourse Analysis to 112 articles from four national UK newspapers in 2013. The authors identified that the majority of articles in their sample represented videogames in a negative light (60%), whereas only 16% focused on benefits of videogames. Out of these negative articles, Whitton and Maclure found the most prevalent theme to be the relationship between videogames and real-life violence (21%), supporting Rogers' findings above. Other popular themes included health risks and videogame addiction, which is also similar to both Rogers' and Williams' discoveries.

In more detail, Whitton and Maclure state that out of the articles representing videogames in a positive light, most of these "tended to be short and presented with an element of surprise" (2015: 4). This suggests that articles focusing on the negatives surrounding videogames were presented with more sincerity than positive ones, which could influence how seriously the readers perceive each article. The authors go on to explain that, despite there being many different genres, platforms and play styles in videogames, the technology was mostly represented as homogenous. They state that "the stereotypical image implied is of a violent first-person interaction" (2015: 5). This, they argue, reinforces the idea that most videogames are violent. Whitton and Maclure criticise this representation by pointing out that many articles used the writers own negative/violent experience of videogames to imply all other experiences will be the

same. They suggest that there may be a financial motive to report on videogames in this way, stating "[i]t is clear that the popular discourse of video games producing violence is the one that sells newspapers" (2015: 8). This highlights the importance of considering financial motives as well as power and ownership in the media for the current project.

More broadly, Whitton and Maclure found that videogames were "frequently portrayed part of a larger spectrum of technology" and, as a result, "part of a much broader narrative of technological evil that corrupts our innocent children" (2015: 5). In other words, by linking videogames to technology in general, they are inherently seen in a negative light. This echoes Williams' idea that there are similarities in the way new technologies are represented in the media and links to the above media panics or technopanics. Considering the authors state this is a common narrative for technology as a whole, it may be likely that this same frame could appear in the representations of VR devices as well.

Each of these studies highlight the importance of researching media representations. For example, Whitton and Maclure argue that "media influence may play a role in shaping attitudes and practices" (2015: 2). They go on to say that negative portrayals of videogames "may have particular impact, since many of those who encounter such images may not have direct experience of gaming, or contact with alternative, less negative discourses" (2015: 8). This could be the same for any new technology, including VR. Williams has a similar view, claiming that "one of the major instruments in the diffusion of knowledge about new technologies is the news media" (2003: 526, emphasis in original). Since VR devices are very new, this idea is highly relevant to the current project. People may get their first (or even only) knowledge about the technology from the media and will form their opinions based on this. It is therefore important to see how the media is portraying these devices.

Furthermore, Rogers (2013) argues that news framing can influence official legislation as well as public attitudes. He states that "[v]ideo game addiction was only officially recognized as a condition [in the American Psychological Association diagnostic manual] starting in May 2013" despite being mentioned in popular news coverage for over 30 years previously. He suggests "[i]t is likely that this shift in policy could be due, in part, to the persistent media frame [of addiction]" (Rogers, 2013). If this is true as these authors suggest, this further highlights the importance of analysing representations of emerging technologies in the news. The way VR devices are framed may end up affecting future legislation, making it important to see what the common representations of these devices are.

Similarly, Whitton and Maclure also argue that media discourse surrounding technologies such as videogames can influence popular understanding, as well as public acceptance of them. The authors' stance was that if negative portrayals of videogames frequently appeared in the news, this would hinder the acceptance of videogames being used in education. It is useful to bear this in mind for the current study, as well as considering what might happen if representations of VR devices are overwhelmingly positive as they are in fictional media. It is possible this could have the opposite effect, with strong acceptance of the technology and little legislation being put in place, which could be concerning considering the strongly immersive capabilities of VR devices.

Emerging Technology

Other emerging technologies that have been analysed in terms of their news media representations include nanotechnologies, genetically modified products and biofuels. Since there may be similarities between representations of different emerging technologies, the findings from such research may coincide with those of the current study. Common themes appearing in these projects suggest that emerging technologies

are often represented very positively, with an emphasis on progress and little attention to potential risks.

For example, Lewenstein, Gorss and Radin's (2005) study aimed to examine the general representations of emerging technologies as a collective rather than on a case-by-case basis. To do so, they carried out their own study on portrayals of nanotechnologies and biotechnologies from 1986 to 2004 and compared this against other studies of emerging technologies. Lewenstein, Gorss and Radin's results showed that, although both positive and negative representations existed, there were many more articles with positive tones than there were negative. Furthermore, they state that "positive stories tend to be much more strongly positive than the negative stories are negative" which highlights "how overwhelmingly positive the coverage is in general" (2005: 16). This finding both contrasts and coincides with the previously mentioned literature – showing similarities to representations of VR in fiction but differentiates from the negative portrayals of videogames. In Lewenstein, Gorss and Radin's study, the positive coverage mainly focused on progress, applications and finance, which shows continuity to some findings from Baumann's (2016) study on wearables. In contrast, the most common theme amongst negative articles was risks. However, the authors stress that the actual number of articles mentioning risks was very low, further enhancing the strongly positive representations.

In another study, Weaver, Lively and Bimber (2009: 152) analysed articles about nanotechnology to uncover how they were being framed by the "10 largest" newspapers in the US, from 1999 to 2008. They found the most common frame used in reporting on nanotechnology to be progress (40%), coinciding with Lewenstein, Gorss and Radin's and Baumann's findings. However, the second most common frame was generic risk (37%), which differs from most of the previously mentioned studies that found positive frames to be the most persistent. This result may have something to do

with the different methodological approach used in this study; instead of finding relevant articles by searching a database for 'nanotechnology' or related terms as the previous researchers did, Weaver, Lively and Bimber used much more specific Boolean operators in their searches. Additionally, after their "human screening" (2009: 153) of the 1,763 articles first found, their sample ended up including just 137 articles in total. This is a very small percentage of the overall articles found which could explain the discrepancies with other research. Alternatively, it is possible that these results may simply be showing more up-to-date representations since it analysed a period after the other studies.

Indeed, Cacciatore et al (2012) suggest existing research on emerging technologies usually shows that coverage starts out very positive but grows more negative over time. As Cacciatore et al's paper was published more recently, it may be that these are now more accurate representations of coverage of emerging technologies. However, whether this is true or not, it is more likely for representations of VR devices still to be in the first stages of coverage of emerging technologies (very positive) since they have only just been commercially introduced to the public.

Despite making this statement, Cacciatore et al found that benefits or risks were not a major focus in their research on US coverage of nanotechnologies. Rather, they found articles to be more focused on research, business, the environment and health. This contrasts with previous research on nanotechnologies and emerging technologies in general. However, Cacciatore et al did not include 'progress' as a theme or frame like most other studies did. Their results may have shown more similarities to previous research if this frame had been included.

Cacciatore et al's study is particularly relevant to the current project because it compared print and online articles. Their study found the major difference between print and online articles to be which topics were focused on the most. For example, online

articles focused much more on environmental factors than print newspapers. Thus, Cacciatore et al state that "online media are providing different and new portrayals of issues rather than merely amplifying traditional US news media portrays" (2012: 1051). Furthermore, their research suggests online news may be "richer and more balanced" (2012: 1055) than print based media alone. If this is the case, there may well be differences in online and print news coverage of VR technologies as well.

These existing studies act as comparative tools, inform the current study's methodology and demonstrate the importance of carrying out research into representations of emerging technologies. The lack of directly relevant literature (specifically VR devices in news) also highlights the very large gap in research for this field. This thesis will fill this gap by focusing specifically on VR devices, covering a large sample of both print and online articles and using a mixed methods approach; all of which will now be elaborated on in the next chapter: Methodology.

Chapter 3: Methodology

This mixed methods study applies Content Analysis and Discourse Analysis to news articles about VR devices to examine how the news media report on VR. This chapter covers the methodology of the research, including an overview of the research methods, sample criteria, justification, and details about the research process.

Mixed Methods

Using a mixed methods approach involves combining quantitative and qualitative research methods (Creswell and Clark, 2011), such as Content Analysis and Discourse Analysis. This approach has the potential to generate strong research data since the different methods can complement each other well. For example, Creswell and Clark state that "the limitations of one method can be offset by the strengths of the other method, and the combination of quantitative and qualitative data provide a more complete understanding of the research problem than either approach by itself" (2011: 8). Indeed, quantitative and qualitative methods both have different benefits and drawbacks, which will now be discussed.

Content Analysis

Content Analysis (CA) is a quantitative research method used to examine communicating texts (Riffe, Lacy and Fico, 2014), such as news articles. It involves "counting or measuring something in texts" with the idea that how often (or not) these variables appear "are indications of something outside the texts" (Boréus and Bergström, 2017: 24). For instance, in the case of the current study, frequent use of positive terms within the texts would indicate that the news media are representing VR positively. According to Hesmondhalgh, CA is "by far the most significant quantitative

method of textual analysis of media" (2006: 121), making it particularly useful for this project.

The key qualities of CA are that it is objective, systematic and replicable (Riffe, Lacy and Fico, 2014; Neuendorf, 2017). In other words, CA follows a structured approach that is applied in the same way to every text within a corpus. Additionally, the research process must be explained thoroughly and specifically so that it can be replicated by other researchers (Neuendorf, 2017). These characteristics make CA easily applicable to a large sample (Krippendorff, 2012), which is a strong advantage of using CA. Similarly, the statistical data collected through CA is very useful in identifying trends, comparing texts and measuring changes over time (Boréus and Bergström, 2017). Each of these factors make CA a very valuable tool for the comparative nature of this study.

In the same way, it was thought that a Sentiment Analysis (SA) tool could be used within the CA process to analyse the positive, negative and neutral sentiment of each article. SA tools are most commonly used for companies to identify the public reaction on social media towards their brand (Liu, 2015), and this project intended to extend its use for analysing sentiments within news articles. Some free SA tools were tested to see which one might be suitable for this study. However, throughout testing, many inconsistencies were found between the different tools (see Appendix 1). For example, one tool rated an article as very positive, and another rated the same article as very negative. Due to these inconsistencies, it was not possible to garner which tool would be the most accurate. Therefore, it was decided not to use a SA tool as it may have skewed the research findings in a direction that was not rigorous. Instead, positive and negative sentiments were extracted through CA by recording the number of positive and negative words that appeared throughout the sample articles (see below for further details on this approach).

Discourse Analysis

Although CA was useful in collecting statistical data, it was mainly limited to de-contextualised frequencies of terms. To gain a deeper understanding, a qualitative approach had to be used. Differently to CA, Discourse Analysis (DA) is a qualitative research method used to uncover underlying meanings in a text. This method "embraces a view of language and language use which suggests that language is not conceived as a neutral instrument for communication" (Bergström, Ekström and Boréus, 2017: 210). In other words, the use of language in specific ways seeks to create intended meanings, and these meanings are what DA aims to analyse. In this way, DA is a suitable method of analysing power within texts (Fairclough, 2010). This could be by seeing who is and is not given a voice in the media, the power the media have in creating/changing perceptions and considering how the news is influenced to suit media companies' agendas (van Dijk, 2016; Bergström, Ekström and Boréus, 2017). To achieve this, DA must consider not just the texts themselves (in this case, news articles), but the wider related context they were produced in (Unger, Wodak and KhosraviNik, 2016). Therefore, DA was used in the current study to analyse how meaning was created and possible reasons why it might have been created this way. This involved an in-depth reading of approximately 25% of the total sample (see below), analysing how sentences and paragraphs were put together and the use of certain words in the context of the article as well as the broader area of VR and technology. Thus, DA expanded on the purely quantitative results produced by CA by considering the wider picture; providing further insight into the meanings created by the sampled articles.

Although this detailed DA was only carried out for 25% of articles, DA was also applied to every article in the sample to identify and compile a set of frames to be used in the framing analysis later in the research process. By reading all the articles, following a qualitative approach, a list of emerging frames was created. This was then

supplemented by frames that had already been found in other related studies (see, for example, Baumann, 2016; Weaver, Lively, and Bimber's, 2009). This process resulted in a list of eight frames: Risks, Regulation, Benefits, Development, Specifications, Commercial, Marketplace and Applications. Each article was then read through again and given one overall frame from the above list based on the main focus of its content. More than one frame may have been present within an article, but the frame it was given was based on what aspect was made the most salient within the text. Once all articles were assigned a frame following this qualitative DA approach, it was possible to count the total frequency in which each frame appeared within the sample, thereby providing quantitative data as to which frames were the most common. These frames, including their definitions, will be discussed in more depth in the next chapter.

Combining CA with DA meant the study could cover a large sample through CA while still being able to analyse deeper meanings that would have been lost without DA. Similarly, one drawback of DA is that, as opposed to CA, it requires interpretation, which means that findings may differ according to the researcher's subjectivity (Gee, 2014). Using these methods together reduces the chance of the researcher impacting the data, while at the same time making sure deeper meaning is not lost and findings are more nuanced.

Sampling Process and Criteria

Devices and Dates

To examine how the media report on VR, it was decided to focus on six different VR devices: Google Cardboard, Google Daydream View, Samsung Gear VR, HTC Vive, Oculus Rift and Sony PlayStation VR. These devices were chosen because they are considered to be the most significant in the new VR trend (Markets and

Markets, 2016; SuperData, 2016). Furthermore, three of these devices are dedicated VR devices (powered by a computer), and three are mobile devices (powered by a smartphone). This enabled a fair comparison between types as there were equal numbers of dedicated and mobile devices.

Since the release dates for each VR device were quite far apart (from June 2014 for Google Cardboard to November 2016 for Daydream View), each device had a different sample period based on when it was released. This spanned from four weeks before to four weeks after the release date of each device. For example, HTC Vive was released on 5 April 2016, making the sample period from 8 March 2016 until 3 May 2016 (see Table 3.1 for all exact sample periods). By following these criteria, it was possible to include any articles that were published in the build-up to the release of the device, and any immediate reactions to them after they became available.

	Release Dates		**Search Periods (4 weeks before, 4 weeks after release)**	
Device	UK	US	UK Release Period	US Release Period
Google Cardboard	25/06/2014	25/06/2014	28/05/14 – 23/07/14	28/05/14 - 23/07/14
Gear VR 2015	02/12/2015	20/11/2015	04/11/15 – 30/12/15	23/10/15 – 18/12/15
Oculus Rift	20/09/2016	28/03/2016	23/08/16 – 18/10/16	29/02/16 – 25/04/16
HTC Vive	05/04/2016	05/04/2016	08/03/16 – 03/05/16	08/03/16 – 03/05/16
Gear VR 2016	02/09/2016	19/08/2016	05/08/16 – 30/09/16	22/07/16 – 16/09/16
PlayStation VR	13/10/2016	13/10/2016	15/09/16 – 10/11/16	15/09/16 – 10/11/16
Daydream View	10/11/2016	10/11/2016	13/10/16 – 08/12/16	13/10/16 – 08/12/16

Table 3.1: Device Release Date and Sample Periods

Note: a cell has a greyed-out section if the UK and US release dates were the same for both territories.

To ensure the study had a wide scope, the collected articles came from UK and US sources in both online and print publications. It was decided to include both UK and US sources for two reasons. Firstly, the aim of the project was to find out what news audiences in the UK were able to read, rather than what UK news outlets publish. With the popularity of online news, UK audiences may read news from the US, perhaps without realising where it was written. As long as an online article is in English, it can

generally be read by UK audiences regardless of where it was published. For example, searching Google News for 'virtual reality' returns articles from both UK and US sources (see Appendix 2), though readers may not be aware where these articles originate. Therefore, including UK and US sources was paramount in understanding how the news portrays VR to people in the UK.

Secondly, the frequency of reports about VR from other English-speaking countries appear to be very low. Searching a worldwide news database called NewsLookUp for VR articles originating in other areas (e.g. New Zealand, Australia, Canada) resulted in very few articles relevant to the study. For example, across the entire year of 2016, there were zero articles published in Canadian publications with "Oculus Rift" in the title, one originating from New Zealand and only two from Australian publications. In comparison, the same search within US and UK publications returned 494 and 46 articles respectively. Moreover, the LexisNexis database found 250 articles with "Oculus Rift" in the headline during 2016 from UK newspapers. With so few English articles originating from outside the UK and US, it was decided to focus on UK and US sources.

Process of Sample Collection

Three different databases were used to collect these articles. Firstly, LexisNexis was used to collect articles from UK national newspapers. However, the version of LexisNexis available to the university is limited to articles from major UK publications. Therefore, another source had to be used to collect articles from a broader variety of publications. The NewsLookUp database has a very wide range of sources that are "not filtered in any manner or weighted in favor of any news organization" and only includes "prominent internet news sites with sufficient unique content" (Newslookup.com, n.d.). Therefore, NewsLookUp was used to collect online articles from UK and US sources.

Lastly, according to SimilarWeb (2016a), the most-visited technology news websites in the UK (but not necessarily originating from the UK) are CNET, Tech Radar, Trusted Reviews, PC Advisor and GSM Arena. Similarly, PC Advisor, Tech Radar, Trusted Reviews, CNET and The Verge were also found to be the most popular by Hitwise (PC Advisor, 2016). More broadly, SimilarWeb (2016b) stated the most popular general news sites were BBC, MSN, Guardian, Daily Mail, and Daily Telegraph. It was important to include such publications in this study as they have the largest audiences according to these sources. Therefore, any of these publications that had not been found in the LexisNexis or NewsLookUp databases were then searched manually, using a mixture of Google searches and the specific website's news archives.

Using a combination of three different methods of collecting articles enabled the analysis of news representations of VR across a diverse range of publications. Indeed, the final sample included articles from 69 different publications, including both general (e.g. national newspapers) and specialist (e.g. technology-specific) outlets.

Within these databases, each device name was searched in quotation marks (e.g. 'Oculus Rift', 'Gear VR') within the title of an article to ensure they were highly relevant. In the case of Daydream View, the following strings were searched: 'Google Daydream', 'Daydream View' and 'Daydream VR' because the device was referenced differently in different articles.

As the study included UK and US publications, it was important to consider the different release dates for each location. Only articles published by US sources were collected during the US release period and only articles published by UK sources were collected during the UK release period. If a device had the same release date for both territories, both US and UK articles were collected. This avoided duplicates and unfair comparisons between the different sample periods.

However, duplicates still appeared in some cases. If this occurred, the article published the most recently was included in the sample. In addition, five types of articles were removed from the total articles found: (1) articles mainly focusing on another topic (whether that was another VR device or something else entirely) were removed to ensure only relevant articles were analysed; (2) articles of which the main focus was a video or podcast were left out as this study focused on analysing written texts; (3) pure reviews were left out because the study focused on analysing news specifically, rather than any text published by media outlets. Though review articles do appear within the final sample, these are reviews that were posted as news rather than simply as a review. This study distinguished a pure review as one with lists of pros and cons about a device as well as a final score for the product. If these aspects were present, the article was removed; (4) articles that simply told readers how to achieve something with a VR device (such as how to set up the device) were removed because these were purely informational and not relevant to the study; and (5) news round-ups of which VR was only a small part were left out since these were not entirely relevant to VR and could have caused inaccuracies. After this screening, the sample consisted of 479 articles.

CA was applied to all 479 of these articles. Due to the time-consuming nature of qualitative methods (Hesmondhalgh, 2006; Creswell and Poth, 2017). DA was applied to 25% of the sample (121 articles). The articles for the DA sample were selected using a random number generator, which listed 121 numbers from 1 to 479. Each number corresponded to a certain article within the sample, and this became the DA sample.

Method

Once the sample was collected, the first stage of CA was applied. This involved recording the features of each article, including the publication name, title and number

of words. The full coding sheet template can be seen in Appendix 3. The sources used within the articles were also recorded, as well as which VR applications and devices were mentioned. This created a broad documentation of the various aspects of the articles.

The VR applications searched for were based on lists of popular VR applications from Blascovich and Bailenson (2011), Davis, Bryla and Benton (2015) and Parisi (2016), but were modified throughout the coding process to reflect the discourse more accurately. For instance, Blascovich and Bailenson (2011) mentioned the following VR applications: product testing, advertising, crime investigations, medicine, military, phobia treatment and virtual vacations. Similarly, Davis, Bryla and Benton (2015) mentioned VR's uses for virtual tourism, research, gaming and military training. Lastly, Parisi (2016: vii) listed these VR applications: "gaming and cinema to architecture, education, training and medicine". For this study, the definitions of these applications were adapted from these authors. However, additional applications were mentioned in the news discourse that were added to this list, such as Arts & Culture and News. The definitions of these were based on the applications that appeared in the sampled articles. The list of searched applications with their descriptions are shown in Appendix 4.

Similarly, news source categories were decided upon based on the findings of the previous Oculus Rift study (Graves, 2016) and revised on the basis of an initial analysis of the sampled articles for this study. Every quote or citation found in the articles was recorded to be from a certain source type as defined in Appendix 5.

The terms used in each article were also recorded. Instead of searching for specific words that were decided upon by the researcher, this study used a different approach to measure the frequency of terms. The text from every article was entered into an online word frequency counter created by WriteWords (see Appendix 6). The counter calculated the occurrence of every word and displayed this as a list. This list

was then copied into a data sheet with the corresponding article number so it could be later analysed. A strong benefit of this approach was that, because all terms were counted, the analysis was not limited by the researcher's pre-conceived list of terms. Furthermore, this created a database of sorts, which can also be used for future studies if necessary.

Once this had been carried out for every article, the results were compiled into one large list of 15,092 unique words. As the number of unique words was too large for further analysis, the initial list was reduced to a smaller and more manageable list consisting of the 2,990 most relevant terms. Although this number is considerably smaller than 15,092, a large portion of the removed words were pronouns (e.g. 'I', 'you'), prepositions (e.g. 'before', 'with'), connectives (e.g. 'and', 'because') and determiners (e.g. 'a', 'the') which would not have been of use to the study. Other removed words were those that had no obvious relation to VR out of context (such as 'animal', 'recipe' and 'umbrella').

These 2,990 words were then categorised into stems to be able to analyse groups of words with similar meanings. This was done manually to ensure words were only grouped if they strongly related to each other. For example, the automatically generated stem 'gam*' could have included the words 'game', 'games', 'gaming', 'gamer', 'gamers' and 'gambling', amongst others. This would not have been accurate as the words do not all have the same meaning. Therefore, these were manually organised into three word groups, with a stem representing any group including more than one word. 'Game', 'games' and 'gaming' were all reduced to the stem 'gam*' and 'gamer' and 'gamers' were reduced to the stem 'gamer*'. This meant the analysis could distinguish between referencing individuals ('gamers') and referencing things ('games'). 'Gambling' was left on its own as this has very different meaning to the other terms.

After this process was carried out for all 2,990 words, the final list included 1,353 words/stems.

Further to this, these words were organised into groups to make detailed analysis easier to apply. Some of these groups were chosen to find out whether certain themes appeared (e.g. immersion, transcendence) and other word groups emerged throughout the coding process. There were three types of word groups: (1) sentiment words (positive or negative); (2) words describing VR in a certain way (such as different, social or high quality); and (3) words referencing people, entities or things (such as companies, users, VR uses and VR devices). Grouping words together enabled analysis of similar types of words as well as individual words/stems.

This chapter has detailed the methods used in the study and how the research was carried out. The findings from CA and DA will now be discussed in the next chapter.

Chapter 4: Findings and Discussion

This chapter discusses the findings from the study, addressing each research question. The first part of the chapter focuses on the overall trends of press coverage of VR, including the type of publications that write about VR (SQ2), where they are published within these outlets (SQ2), which devices are written about the most or the least (SQ1), the framing of VR within the articles (RQ1), the sources used in news articles (RQ1) and which VR applications are mentioned within the discourse (RQ1). The second part of the chapter focuses on the themes that represent VR positively within the sample (RQ1), followed by a section addressing the negative themes of VR (RQ1). Both sections highlight any differences between coverage of each VR device (SQ1) and between publications (SQ2). Finally, the chapter ends with a critical discussion about the role of the journalist in creating these representations.

The Landscape of VR News Coverage

Publications Reporting on VR

To cover a broad scope, this study purposely collected articles from a range of different news sources, including print and online publications, as well as a variety of generalist and specialist titles (see Appendix 7). Analysing the number and placement of articles from these publications shows that VR is treated differently by each type of newspaper. This contributes to answering SQ2, which aimed to uncover the differences between VR news coverage in generalist and specialist publications.

As shown in Table 4.1, out of the 69 different publications, 44.9% of the titles were generalist newspapers (such as the Independent, or US local newspapers that cover a wide range of news stories), while 55.1% were specialist news sources that focused on a particular type of news (such as technology and science or business). Thus, the

number of generalist and specialist news outlets covering VR news was almost equal. However, specialist news outlets did have significantly more articles in total, with 72.4% of the sampled articles originating from these publications, and 27.6% being from generalist publications. Moreover, only 12 out of 479 articles (2.5%) came from print newspapers. This distribution suggests that VR is reported on more often by specialist publications, and when it comes to generalist newspapers, it tends to be included in their online versions more frequently than in the print versions.

Type	Number of Publications	Percentage of Publications	Number of Articles	Percentage of Articles
General*	31	44.9	132	27.6
Print	4	5.8	12	2.5
Online	27	39.1	120	25.1
Tech/Science	25	36.2	261	54.5
Business	7	10.1	37	7.7
Entertainment	3	4.4	13	2.7
Digital	1	1.5	10	2.1
Politics	1	1.5	1	0.2
Gaming	1	1.5	25	5.2
TOTAL	69	100	479	100

Table 4.1: Number of Publications and Articles from Each Publication Type

*Articles from General publications came in both print and online formats. The breakdown of print and online articles within these General publications is shown here.

For further analysis, these publications were organised into three categories: General, Technology & Science, and Other. The latter consisted of publications in business, entertainment, digital, politics and gaming categories.

Though both types of VR devices (mobile and dedicated) were written about by each publication type, General news outlets were more likely to write about dedicated VR devices than mobile VR devices. Out of all the articles about dedicated VR devices, 32% of these came from General publications. In comparison, out of all the articles about mobile VR devices, 15% of these came from General publications (see Appendix 8). Therefore, it appears that dedicated VR devices are reported on more in the

mainstream media than mobile VR devices are. Indeed, 117 online articles focused on a mobile device compared to only one print article, which was only 124 words in length. This suggests that VR – particularly mobile VR – is often considered less newsworthy by print publications.

As well as articles appearing across a broad range of publications, the specific sections in which articles appeared were also very diverse. In total, 101 different sections or tags were recorded for online articles (including 'N/A' for articles with no visible section or tag). For analysis, these sections or tags were divided into 36 different categories, 25 of which had at least 2 articles falling into that group. This indicates how publishers value VR news in vastly different ways. Unsurprisingly, publications most frequently placed VR articles in technology and science sections (26.9%), and these sections were favoured by General publications. Technology & Science publications, however, tended to be more specific in their article placement, with 32.2% of texts from these publications appearing in VR-specific sections such as 'virtual reality'. Some Technology & Science publications even had device-specific sections, such as 'Google Cardboard'. In total, 25 articles (9.6%) had device-specific sections amongst these publications, but none were observed in the General publications. This shows that VR is valued differently by generalist and specialist news outlets, since they have different audiences.

Regarding the sections in which articles appeared, print newspapers were analysed separately for two reasons: (1) the number of sections within a print newspaper is more limited than online news outlets (whether specialist or generalist); and (2) unlike online articles, print articles have page numbers. Whereas it is unclear whether an online article was in a prominent location at the time of posting, it is possible to assess the relative newsworthiness of a news story in a print newspaper by the page(s) it was printed on.

Out of the 12 print articles, most were placed far back in the newspapers in sections for news and features. The articles mostly appeared from pages 25-43, with two exceptions. One article covered pages 2-3 of The Sunday Times and this focused on detailing the specifications of all six VR devices searched in this study. Another article was published on page 8 of the Daily Telegraph, which highlighted the possible anti-social effects of VR. This second example suggests that mass media may be more likely to place VR news stories in prominent positions if they can be used to create a moral panic about VR. However, with only two VR articles appearing in early pages of UK national newspapers, this does not seem to be a common trend at this point in time.

Articles and Mentions for Each Device

As well as there being differences between publication types, the attention given to both device types, as well as each individual device, varied quite dramatically. This provides insight into SQ1, which aimed to explore the differences between representations of VR for each device. PlayStation VR was written about the most during its sample period with 151 articles, making up 31.5% of the sample. In contrast, there were just 10 articles (2.1%) about Google Cardboard. At first glance this may suggest that VR devices are being written about more frequently over time, since Google Cardboard was released in 2014 and PlayStation VR was released in late 2016. However, inspecting the number of articles for each device over time shows this is not the case (see Appendix 9). Rather, it appears the volume of articles is influenced by the characteristics of the devices. Across the sample, 75% of articles were about dedicated VR headsets and 25% focused on mobile devices. Therefore, the press reports more frequently on dedicated VR systems rather than headsets that use a smartphone.

Another reason PlayStation VR had the most articles could be that news companies may expect their readers to be more familiar with the Sony and PlayStation

brands than they are with the Oculus Rift, for example. Particularly, since VR's main commercial focus at the moment is videogames, it is easy for media outlets to run a story about a product with 'PlayStation' in its name since it would have obvious connections to videogames, so it would not need to be explained or justified further.

This could also be one reason why PlayStation VR was the only device to be mentioned by almost as many General news outlets as Technology & Science outlets (see Appendix 10). The majority of articles about every other device came from Technology & Science publications. This highlights how the media, particularly general news outlets, may focus on VR's use in videogames over any other application – a theme which will be discussed later.

As well as counting the number of articles per device during their search periods, it was also recorded how many times each device was mentioned across the entire sample. It was very common for an article to reference another VR device than the one it focused on, with 59.3% of articles mentioning more than one device. Furthermore, the number of articles about each device during their sample periods did not always correspond to how often they were mentioned (see Table 4.2).

	Articles	**(%)**	**Mentions**	**(%)**
Daydream View	62	12.9	78	16.3
Gear VR*	46	9.6	139	29
Google Cardboard	10	2.1	75	15.7
HTC Vive	89	18.6	254	53
Oculus Rift	121	25.3	301	62.8
PlayStation VR	151	31.5	226	47.2
TOTAL	479	100	1073	N/A

Table 4.2: Number of Articles and Mentions of Each Device

*This reflects the number of articles about Gear VR 2015 and 2016 because the mentions of Gear VR could not be distinguished between the two years.

Although PlayStation VR had the most articles dedicated to it during its respective sample period, Oculus Rift was mentioned the most across all 479 articles (62.8%). This appears to be because both mainstream and specialist news outlets define

Oculus Rift as being the VR device that started this VR trend. For example, the Daily Mirror called Oculus Rift "the headset that kickstarted the VR revolution" (Parsons, 2016a). Similarly, Popular Science introduced Oculus Rift as "the high-quality virtual reality headset that kickstarted the modern virtual reality craze" (Franzen, 2016). Oculus Rift is frequently mentioned in articles about other devices to give an overview of the VR market, showing representations of this device are slightly different to others in this way.

At the other end of the scale, Google Cardboard had both the least articles and the least mentions. As it was released in 2014, before VR gained popularity in 2016, it is not surprising that there were not many articles published about it at the time. However, what is surprising is that it had the least mentions of all devices. Since it was the first product out of the sample to be released, it had the most opportunities to be mentioned as a reference point in articles about other devices, but was only mentioned in 15.7% of articles. As the majority of sampled articles were published in 2016, it may be that journalists do not think it is worth mentioning a device that was released two years before. Furthermore, due to the simplicity of the device (being literally made from cardboard), the press may judge it to be inferior to all other devices in the sample and thus not worth mentioning.

Similarly, the other Google product – Daydream View – was also only mentioned in 16.3% of articles. However, this was the latest device in the sample to be released so it did not have the opportunity to be mentioned in most other sample periods since it had not yet been announced. Nevertheless, overall, mobile devices had both the least number of articles and least number of mentions compared to dedicated devices (see Appendix 11). This could be because the advanced technology used to create dedicated VR devices is considered more newsworthy than a headset that is simply used to hold a smartphone with no digital technology inside the actual headset itself.

Frames

Though the number and placement of VR news articles may highlight how newsworthy VR is deemed, the context of the articles must be analysed to examine how VR is represented (RQ1). One way this was done was by assigning each article a frame. As mentioned in Chapter 3, eight frames emerged by applying DA to all 479 articles whilst keeping in mind the frames found in similar studies (see Weaver, Lively, and Bimber, 2009; Baumann, 2016). The definitions of each of these frames are described in Table 4.3.

These items were defined as frames rather than themes because the aim was to analyse which aspects of VR were made the most salient by the news media. Whereas themes simply highlight what topics appeared within the articles, analysing frames "describe[s] the power of a communicating text" (Entman, 1993: 51).

Frame	**Criteria (articles emphasising…)**
Applications	What VR can be used for, such as videogames and healthcare applications.
Benefits	Possible or known benefits of using VR, such as medical rehabilitation.
Commercial	How and where readers can purchase certain devices, where device demos are being held and issues with the supply of VR devices.
Development	The progress of VR. This includes how VR or a specific VR device has developed over the years, the release of a new device and new features or updates for a VR device or platform.
Marketplace	VR's position within the VR or technology market. This includes a device's impact on the VR market, a device's relationship with competitors, information about (or targeted to) investors and predictions about the future of the VR market.
Regulation	The ways VR is, or should be, regulated.
Risk	Possible or known risks of using VR, including issues such as eye strain and motion sickness. This could be actual risks as well as exaggerated issues portrayed as risks.
Specifications	The specifications of a device, such as technical specifications, its size/weight/appearance and analysis of the hardware.

Table 4.3: Criteria used to determine which frame related to which articles

Although articles sometimes included aspects related to more than one frame overall, each article was assigned one frame corresponding to which aspect was made the most prominent. Therefore, some additional clarifications should be made about the

differences between these frames. Firstly, articles that focused on comparing the specifications of two or more different devices were framed as Marketplace rather than Specifications. This is because the main focus is on the comparison between the two, rather than simply stating the specifications of one device, which highlights the competition in the market.

Articles with any of the above frames could have also included information on how to buy a VR device. However, the Commercial frame was only used for those articles that made the information about how to buy most salient. For example, the title may be headlined something like "You can now buy Oculus Rift" and/or the information about how to buy could either take up the whole article or be placed at the beginning of the article. In these cases, the Commercial frame was considered most prominent and this was assigned to such articles.

Moreover, many articles focused on the release of VR devices but also how readers are able to purchase these devices. If an article mentioned the device had been released, with no information on how to buy it, the article was framed as Development. On the other hand, if an article mentioned how the reader can buy the device, it was classed as Commercial. This is because the publication is (in)directly encouraging readers to buy the device by providing them with a way to do so, rather than simply focusing on the fact there has been a new development in the market by stating a new device has been released.

Out of these eight frames, Applications was the most common (29%). This shows that many articles focused on what VR can be used for rather than the devices themselves. Furthermore, significant portions of articles had the Development and Specifications frames (see Table 4.4). Since the sample period was during each device's release, it is unsurprising that many of the articles focused on announcing the release or detailing the specifications of the products as these frames highlight. Moreover, the

common Development and Applications frames show similarities with Lewenstein, Gorss and Radin's (2005) study of other emerging technologies.

Frame	No. Articles	(%)
Applications	139	29
Development	97	20.3
Specifications	93	19.4
Commercial	63	13.2
Marketplace	62	12.9
Risk	15	3.1
Regulation	5	1
Benefits	5	1
TOTAL	479	100

Table 4.4: Distribution of Frames

As was also to be expected by the number of articles that mention more than one device (see above), 12.9% of articles had the Marketplace frame, most of which involved comparing various VR devices. Whereas the Marketplace frame focused on VR devices' position in the industry, the Commercial frame focused on topics targeted to VR consumers. Most articles with the Commercial frame encouraged readers to buy the devices through providing links to websites to make purchases or mentioning where it can be bought or demoed. This makes it particularly significant that 13.2% of articles had the Commercial frame, which suggests news companies may have something to gain by providing these links to buy VR devices.

In contrast, just 3.1% of articles had the Risk frame. This further suggests that, unlike other new media, the press are not creating a moral panic about VR, at least not at this stage. Though it should be noted that risks were mentioned in other articles as well, only 15 articles made this the main point within the article. Similarly, just five articles (1%) had the Regulation frame which focuses on ways of reducing these risks. As detailed in Chapter 2, these results are similar to what was found in Lewenstein, Gorss and Radin's (2005) study of emerging technologies and Baumann's (2016) study

of wearables. However, it significantly differs from news coverage of videogames, in which mentioning risks is very common (Williams, 2003; Rogers, 2013; Whitton and Maclure, 2015). Since frames can influence public opinion (D'Angelo and Kuypers, 2010), it is worth noting that, based on the sampled articles, the press did not seem to be attempting to influence public opinion negatively. However, only five articles (1%) had the Benefits frame. Though the Benefits frame appeared slightly less than the Risk frame, they were both very rarely used. This shows that the coverage focused on neither benefits nor risks of VR. As will be seen later in the chapter, positive and negative themes of VR come across in ways other than explaining its risks and benefits.

Sources

In a similar way, the sources used within the articles highlight the aspects of VR that are made most salient. Out of the whole sample, 58.5% of articles included quotes or citations, ranging from one to 26 per article. A significant portion of articles did not reference any sources, though this does not mean they were not used. Indeed, through DA, it was found that articles published on or around the same date were often quite similar, meaning these were likely based on press releases.

Out of the sources that were used, Device Owners/Creators were the most common, with 380 citations in 32.2% of the sampled articles (see Appendix 12). It could be argued that these sources are used as primary definers of VR news coverage. Since these owners and creators are invested in VR being successful, it is very unlikely they would focus on negative aspects of VR. For instance, Fortune quoted Chet Faliszek from Valve – the company that created HTC Vive with HTC – stating: "We have no exclusives […] We want to do everything we can to make sure VR succeeds, regardless of the platform. I don't think a customer ever thinks a platform-exclusive game is a good thing" (Gaudiosi, 2016a). In other words, there will be no applications

exclusive to HTC Vive, as they will also be available on other VR devices. This portrays HTC, Valve and HTC Vive in a positive light as they are seen to be attempting to make VR more accessible to consumers. If the primary definers represent the technology positively, this may result in positive public perceptions of it.

Similarly, Content Creators were cited often compared to other types of sources – 192 times in 8.8% of articles. Since Applications was the most frequent frame found in the sample (see above), this is not surprising. However, as these sources create content for VR, they are also unlikely to speak negatively about the technology. For example, Newsweek quoted Lindsay Jorgensen – one of the designers of VR game Fantastic Contraption – stating the game works "because the team labored to 'never say 'no' to the player'" (Burningham, 2016). This portrays the game as very versatile because players are able to have many different experiences. As a result, the game, and thus VR, is portrayed positively. In contrast, views from the general public might have been more varied; however, the general public were only cited 12 times in 1.5% of articles. These examples demonstrate that by focusing on quotes from these sources, the press avoids negative portrayals of VR, which supports H1 because VR news coverage was expected to be more positive than negative.

It is also significant that Other Publishers were the second-most common source – used 217 times in 12.5% of articles. This shows the lack of originality in the discourse and highlights the potential for the same ideas or topics to appear in several publications. In other words, if using other publications as sources is commonplace as this finding suggests, the focus of one article may become the focus of another and so on. Thus, the news discourse ends up lacking a variety of perspectives that the public may use to form their own opinions of VR.

VR Applications: the Entertainment Focus

With Content Creators being sourced often and the most common frame being Applications, the findings from the applications section of the coding sheet (see Table 3.2 for the applications recorded) become even more relevant. The vast majority of articles mentioned at least one VR application (84%) and analysing how often these applications were mentioned found news discourse to be strongly focused on the entertainment uses of VR. Videogames were by far the most frequently mentioned application, appearing in 75.6% of articles (see Appendix 13). Though far behind, the second-most common application was Film/TV/Video, which was mentioned by 25.7% of the sampled articles. However, VR's use in health care was only mentioned in 3.8% of articles and its educational uses were mentioned in even less – 2.7%. Apart from those already noted, the only applications that were mentioned 10 times or more were Simulator (8.8%), Communication (7.7%), Design (6.1%), News (3.1%) and Travel/Tourism (2.7%). Each of these percentages are relatively low when compared to Videogames and Film/TV/Video. It is also notable that only four articles (0.8%) mentioned pornographic uses of VR. Mentioning this application could have been a way for the press to create a moral panic about VR. However, this has not happened, which further supports the idea that a moral panic is not currently being created about VR. Instead, it appears the media mainly focus on VR's use in leisure and entertainment.

Despite the number of mentions of several applications being low, the coverage was quite broad overall, with almost all of the searched applications appearing at least once. The only applications that did not appear were Military, Real Estate and Science. The lack of military-based applications is significant considering VR's origins in military use. It appears the media have neglected to mention VR's origins in this way, instead focusing on its current uses available to consumers. Similarly, the lack of

mentions of Real Estate and Science applications further highlights the focus on leisure and entertainment in the articles.

Moreover, there is further evidence to suggest news coverage typically focuses on VR's use in entertainment through analysis of the words appearing in the sampled articles. The stem 'gam*' ('game', 'games', 'gaming') was the most popular term recorded, with 3,100 instances across the sample (note that all stems were created manually so they would not include unrelated words; see Chapter 3). The stem 'play*' ('play', 'playing', 'played') was another popular term with 790 mentions. A VR device does not have to be 'played' but this was the most common word to describe interaction with the devices. This highlights not just how much the sample was entertainment-focused, but more specifically, that it was strongly videogame focused.

Furthermore, when referring to types of people, terms for gamers (e.g. 'players' and 'gamers') were mentioned the most (495 times combined), aside from general terms for VR consumers like 'customers' and 'users' (824 times combined). In contrast, people related to education (e.g. 'teacher', 'trainer') were mentioned 19 times and people related to health care (e.g. 'patient', 'doctor') were mentioned 40 times. This demonstrates the vast difference in focus on VR's use in entertainment and VR's use in other industries.

As well as recording which applications were mentioned in each article, the terms relating to VR uses were also analysed. Words relating to VR's use in entertainment ('games', 'movies', 'films' and so on) were mentioned the most by far (3,948). A large portion of this is just from the stem 'gam*' mentioned above. However, even after removing the 'gam*' stem from entertainment-related uses, these uses were still mentioned the most (848 times), barring general terms like 'application' and 'software' which were mentioned 856 times in total. In contrast, words relating to education and health care applications were mentioned much less (114 and 76 times

respectively). Again, it is clear the coverage is extremely entertainment-focused. This may cause readers to believe VR is mostly for entertainment and, as a result, they may not realise the full potential of the technology. Alternatively, because VR's main commercial focus is currently videogames, this suggests the press are aligning with VR companies to achieve success of VR in this respect. Indeed, it has already been established that device owners and creators are often made the primary definers of VR topics (see above). Moreover, as will now be discussed, news coverage of VR appears to be mostly positive.

Positive Representations of VR

VR is *"Great"*

Despite few articles having the Benefits frame, the discourse was still more positive than negative. Out of all articles, 91% had at least one positive word, while 70.2% of articles had at least one negative word. Though that appears to be quite a high percentage of articles with negative words, the number of times these words were mentioned demonstrates the difference better. Positive terms were mentioned over twice as many times as negative words (202.9%), despite there being less unique positive than negatives words in total. On average, each positive word was mentioned 16.5 times and each negative word was mentioned 5.6 times. Furthermore, the most common positive words were mentioned many more times than the most common negative words (see Table 4.5). Additionally, when examined in context through DA, some of the top positive words seem to be more strongly positive than the top negative words are negative. For example, Newsweek described one VR game as "perfectly executed" (Burningham, 2016), whereas TechCrunch mentioned Oculus Rift's "headphones aren't too bad actually" (Matney, 2016). Though the second statement implies the headphones

are not of the best quality, the negative sentiment is not as strong as the positive sentiment in the first quote.

Positive		**Negative**	
Word	**Times**	**Word**	**Times**
best	338	expensive	94
great*	201	evil	86
prett(y/ier)	127	lack*	54
fantastic(ally)	108	bad	53
perfect*	107	scar(y/es)	46

Table 4.5: The Top 5 Positive and Negative Words

In addition, although 'evil' is a negative word, when analysing its use across the DA sample, it never appeared in a negative context. Instead, this term was usually used to reference a VR videogame called Resident Evil 7. Other examples included using 'evil' to describe VR games, though not in a negative light. For example, New Atlas stated VR users can find themselves in a variety of VR environments, including "an office inside the lair of an evil mastermind" (Shanklin, 2016a). Therefore, the word 'evil', cannot be considered as making the coverage more negative. This also highlights the benefit of using DA alongside CA so that instances such as these do not lessen the accuracy of the findings.

In a similar way, the stem 'fantastic*' appears to be very common because of the VR games Fantastic Contraption and Fantastic Beasts and Where to Find Them which are mentioned often across the sample. However, unlike 'evil', 'fantastic*' was found to be used in positive contexts in addition to naming VR games. For example, within the title of one article by the Independent was the claim that PlayStation VR is "[a] fantastic introduction to Virtual Reality gaming" (Shepherd, 2016). Therefore, the positive words with the most mentions better reflect the coverage of VR than the most common negative words. This supports H1, which expected positive portrayals of VR to be the

most prominent. Moreover, the findings show similarities to Chan's (2014) study of VR in fiction, and Lewenstein, Gorss and Radin's (2005) study of emerging technologies.

Interestingly, there was little difference between the number of articles using positive and negative words for different publication types. General news outlets had the largest percentage of articles with positive words (97%) whereas positive words appeared in 89.3% of articles from Technology & Science publications. Though this is a small difference, it does partly reject H2.1, because generalist news outlets were expected to be more negative/critical about VR.

VR is Revolutionary

As will now be discussed, other common ways in which VR was represented within the sample contribute to this positive coverage of VR. One way this was achieved was by showing VR to be revolutionary. The stem 'revolution*' ('revolution', 'revolutionary', 'revolutionise', and so on) was mentioned 21 times across 19 articles in the sample. Although this is a small amount, representations of VR as revolutionary can be better seen elsewhere. For something to be revolutionary means it involves change – it is new or different to what it has been. The fact 20.3% of articles had the Development frame enhance this idea of VR as revolutionary because these articles focused on either how VR has changed or that it has just been released. In addition, several terms that allude to difference and newness appeared across the sample. In fact, excluding the general positive and negative words discussed above, terms in the New category were the most common. This included words such as 'new', 'upcoming' and 'futuristic' amongst others. These words appeared 2,853 times in total in 92.9% of the sample articles.

Although this may hint at the revolutionary aspect of VR, it is not surprising that words relating to newness would be common since the sample period covered the

release dates of each device. Indeed, after 'new', 'launch*' ('launches', 'launched') was the most common stem in this category, with 728 mentions in total. Nevertheless, the media could have opted for a different angle in VR coverage, so this focus on VR as 'new' enhances the idea that it is revolutionary.

Though words relating to difference (e.g. 'unique', 'unusual') were less common than those relating to newness, 44.5% of articles used terms in the Different category, making up a significant portion of the discourse. It appears that VR is much more likely to be portrayed as different rather than ordinary, with words relating to difference used 2.8 times more than words in the Normal category.

By applying DA to inspect these instances in context, it appears the media mainly focus on this revolution for the videogame industry. For example, an article from the Independent insists that "there's no doubt about Virtual Reality being the future of gaming" (Shepherd, 2016). Similarly, the Daily Mirror quoted Google: "With Daydream View and a Daydream-ready phone like Pixel, you'll be able to kick back in your personal cinema, explore new worlds and get in the game like never before" (Parsons, 2016b, emphasis added). This article extends VR's use to cinema, but still maintains the entertainment focus. Notably, this quote emphasises how these experiences will be different to anything audiences have already experienced, highlighting VR's revolutionary qualities.

Though less common, articles sometimes mentioned VR's revolutionary potential in other areas. TechCrunch stated "Rift will change much more than gaming […] Communication, film, education, travel and business are poised to be revolutionized by VR" (Constine, 2016). Here the author emphasises the impact VR could have on other industries. However, this is later dampened down when the author mentions: "If you're looking to explore a new paradigm for reality more than to shoot down spaceships, it might still be too early", suggesting the revolutionary aspect of VR

is mostly related to videogames at the moment, though there is potential for it to revolutionise other areas in the future. Therefore, it is clear the sample represents VR as revolutionary, even if it is mostly limited to videogames.

VR is Advanced High Quality Technology

Though a less common theme, VR was portrayed positively by being shown as advanced and high quality technology. Terms in the Advanced Technology category appeared in 29.4% of articles, and terms in the High Quality category were used in 35.9% of articles.

Out of every device, HTC Vive appears to be the one the media represent as the most advanced or high quality. This device had the largest percentage of articles with words in the High Quality category (42.7%) and defining HTC Vive as "the most technologically advanced VR system currently has to offer" (Daily Telegraph, 2016) or similar was not uncommon. One very strong representation of HTC Vive as high quality and advanced appeared in articles that covered BMW's use of the device. New Atlas stated: "Instead of needing expensive specialized facilities to use VR technology, the automotive giant [BMW] is taking advantage of the HTC Vive's impressive capabilities for fast-turnaround interior modeling feedback" (Collie, 2016). In itself, the fact a large and established company like BMW is using this device endorses its high quality. This is further enhanced by calling BMW an "automotive giant", which highlights its prominence and importance. In addition, using the phrase "taking advantage of the HTC Vive's impressive capabilities" rather than, simply, 'is using HTC Vive', puts even greater emphasis on how advanced the device is as well as how positive this quality is. As HTC Vive is a dedicated VR device, this finding supports H1.2 as it was expected that dedicated devices would be represented as of higher quality than mobile devices.

This high quality and advanced theme can also be seen through the common use of jargon within the sample. Overall, 86% of articles used terms that could be considered jargon or that related to the specifications of the devices. Additionally, as 19.4% of articles had the Specifications frame, it seems that at least that percentage of articles put particular emphasis on this jargon, which could show VR as advanced technology.

Identifying jargon in context through DA shows just how this works to create a portrayal of VR as high quality and advanced. Writing about Daydream View, CIO detailed its specifications: "Gyroscope, accelerometer and magnetometer fusion deliver accuracy that synchronizes the head movement with very low latency, rendering a high quality VR experiences [sic]" (Patterson, 2016, emphasis added). Words that could be considered jargon have been marked in italics. The sentence starts out with a list of specifications that readers may not understand. However, this is noted to "deliver accuracy", which most readers would understand as positive. The jargon that readers may not understand portrays VR as advanced technology, but to ensure a positive view of VR, this is supported by the reassurance that these features will create a high quality VR experience.

The use of jargon or words relating to specifications was very common across all publication types. General publications were most likely to use terms in this category, with 90.2% of articles from General publications using these words. Similarly, 85.8% of articles from Technology & Science publications included jargon or specifications, as did 80.2% of articles from Other publication types. This is surprising because the audience for General publications may not be as familiar with VR as readers of Technology & Science publications. Thus, it was expected that General news outlets would explain VR in simpler terms. However, this does not seem to be the case. For instance, the Daily Mirror described the specifications of Oculus Rift using jargon:

"Oculus Rift boasts an OLED display with a 2,160 x 1,200 resolution and a 110-degree field of view. The refresh rate is listed at 90Hz" (Parsons, 2016a). The writer continues to state the computer requirements for HTC Vive and Oculus Rift are: "Nvidia GTX 970 GPU and Intel i5-4590 CPU […] In terms of RAM, you only need a PC running at least 4GB". Instead of explaining VR in simple terms to its audience, jargon is used that readers may not understand; while at the same time, representing VR as advanced technology.

With the use of jargon and device specifications being common, it may be thought that VR would also be portrayed as complex. However, words in the Complex category (including 'complicated', 'tricky' and 'confusing') were only used in 14.6% of articles. In contrast, words in the Ease of Use category were used in 49.5% of the sampled articles. Unsurprisingly, since they are more advanced, words relating to complexity appeared more often in articles about dedicated VR devices than mobile devices (16.6% to 8.5%). This is also supported by the DA results, with Google Cardboard in particular represented as very simplistic. Gizmodo called this device "stunningly minimal" (Feinberg, 2014) and Engadget highlighted its simplistic design: "a small brown square, barely large enough to accommodate a thin book for shipping purposes" (Honig, 2014). It appears this simplicity is not used to criticise Google Cardboard, but to portray it in a positive light; further highlighting the lack of negative framing within the discourse.

Generating Hype

Another way the news represents VR positively is by generating hype for the technology. Fourteen terms relating to hype were found in the sample. This included words such as 'buzz', 'craze' and 'excitement'. Though not found in the majority of news reports, these terms appeared in 33.8% of articles, constituting a significant

portion of the sample. Hype appears to be slightly higher for dedicated VR devices than mobile devices, with 36.3% of articles about dedicated devices including terms from the Hype category, compared to 26.3% of articles about mobile devices. This demonstrates one of the differences between the coverage for both device types, contributing to answering SQ1, which focused on examining the variances between representations of the devices.

Moreover, most devices were shown to be much anticipated, making them appear popular and important while also contributing to the hype. For example, the Daily Telegraph explicitly called Oculus Rift "[t]he eagerly-anticipated headset" (Telegraph Reporters, 2016) and Fortune called it "[t]he highly-anticipated Oculus Rift" (Brueck, 2016). Similarly, another article from the Daily Telegraph stated: "It's exciting stuff. Virtual reality is one of the most exciting tech developments of recent years" (Daily Telegraph, 2016). This emphasis on excitement and anticipation shows how news coverage aims to generate hype about VR, thus possibly creating a desire in readers to buy the products.

That two of the above quotes came from a General news outlet is significant. It was expected that technology specific outlets would aim to generate a lot of excitement and positivity about VR since they target its consumers. However, in actuality, it appears General news media are hyping up VR even more so than other news outlets. General publications had more articles using terms related to hype (45.5%) than Technology and Science and Other publications, both of which had hype-related words in approximately 29% of their articles. This rejects H2.1 since General news outlets seem more positive about VR than specialised outlets.

To gain a better understanding of whether the hype surrounding VR corresponds to the Hype Cycle mentioned in Chapter 2 (Fenn and Raskino, 2008; Gartner, n.d.), the number of articles published was measured over time separately for each device. This

found that all sample periods had the most articles at or within two days of the release date of the device, apart from Gear VR 2015 and 2016 (see Appendix 14). The number of articles about Gear VR 2015 peaked approximately three weeks before the release date. This coverage focused on the fact that the device could now be pre-ordered, which demonstrates the commercial focus of the texts as found in the frames analysis. However, there were zero articles about Gear VR on its 2016 UK release date, and only three for its US release date. Its peak during the US sample was over two weeks before the release, when Samsung announced the device. The lack of coverage of this device could have been influenced by the issue Samsung had with the release of their new phone, which was designed for use in the Gear VR headset. After the phone was released, consumers reported the product was catching fire and exploding (Titcomb, 2016) and Samsung had to recall the phones. This would have ultimately impacted on the success of Gear VR 2016, because this was one of the few phones the headset was compatible with at the time (see Chapter 1).

It is notable that only one sampled article mentioned this defect. Trusted Reviews took a serious stance on the matter, headlining an article: "Using Galaxy Note 7 with Gear VR could blow up in your face, Oculus warns" (Smith, 2016). The article continued: "A battery blowing up while charging is one thing, but a battery exploding while so close to the eyes would likely cause very serious injury". This is an example of an article that had the Risk frame. Despite the serious tone from one publisher, this was the exception amongst the sample, which is evident in how few articles had the Risk frame. The media generally avoided negative portrayals of Gear VR by not reporting about it at all (in UK publications) or focusing on other aspects of Gear VR (in US publications).

Articles about all other devices peaked during their release. However, PlayStation VR had another peak with almost as many articles as it had for its release

date just over one week prior to this. Most of these articles were reviews of PlayStation VR so it is likely this date was when the press had been allowed to release their reviews of the product. This raises an important point that could be a major reason for the coverage to be generally quite positive towards VR. VR companies often sent their devices to the press before their actual release dates (see, for example, Co, 2016). This early access, as well as what conditions are set in the included press kit, may have influenced the media to write about VR more positively than those who had not been gifted a device early. Though it cannot be certain which publishers were provided with an early-access device, it is very likely that those who published reviews of the device on or before its launch day had been provided with a copy early. Otherwise, they would not have been able to review it so close to the release date. Since many reviews were published on the launch date for most devices, it seems a large portion of media outlets had been given early-access and thus could explain the mostly positive coverage.

The study also explored whether the discourse corresponded to the Gartner Hype Cycle. As mentioned in Chapter 2, the Gartner Hype Cycle suggests that during 2016 and onwards the amount of hype about VR would be growing, though it is not at its highest point (Gartner, 2016). However, apart from identifying peaks in the number of articles published, there was no overall upward or downward trend over time for all devices. The number of articles before and after the release dates fluctuated, but was generally a lot lower than the amount published on the actual release dates. Positive and negative words were also measured over time in an attempt to identify hype more accurately. However, this did not provide any conclusive results. Positive and negative words mostly fluctuated across each device's sample period, with no overall trends to be found. Thus, the sample does not seem to correspond to the Hype Cycle neither as a whole nor by individual device. Still, since the sample periods for this study were not evenly spaced over time and only spanned two years, it is not a sound conclusion that

the Hype Cycle does not apply to wider coverage of VR. What is certain is that hype does exist, particularly during the release dates of the devices, but further studies will need to be conducted in order to monitor trends over a longer period of time.

VR is Important

Just as generating hype for VR highlights its significance, VR was also commonly represented as important. Terms in the Important category (such as 'important', 'powerful' and 'significant') appeared 968 times in 66.4% of articles. In addition, DA found VR was shown as important by dubbing 2016 the year of virtual reality. For instance, the Daily Telegraph noted: "technology has caught up with our ideas, with three commercial headsets released. 2016 - the year of VR" (Hoggins, 2016). This makes VR seem very current and new and highlights its prominence.

Additionally, VR's importance is heightened by the media's use of well-known names and companies. For example, journalists tend to use names that are related to VR products to enhance importance. One article from Time about Oculus Rift stated: "it's the approach Facebook CEO Mark Zuckerberg found persuasive enough to pay $2 billion for, snatching up Rift parent company Oculus VR" (Peckham, 2016). This statement makes sure to emphasise the importance of Oculus Rift in several ways. For some, the name Mark Zuckerberg would be enough to demonstrate the importance of VR. For those not familiar with the name, the author makes sure to include that he is not only connected with Facebook but is the CEO of Facebook, making his involvement appear even more significant as he has a prominent position. The importance of VR is enhanced even further by mentioning the large amount of money Mark Zuckerberg bought Oculus VR for. Additionally, the use of the expression "snatching up" suggests the company was much sought-after and that if Zuckerberg had not bought it someone

else would have. In just over 20 words, this sentence greatly emphasises VR's importance, particularly relating to Oculus Rift.

This type of coverage is not device-exclusive. CNET mentioned the range of companies working on VR devices: "companies from Facebook to Google to Microsoft know that VR is likely the next step up from phones, tablets and computer screens" (CNET, 2016). The mention of well known, multi-billion companies like Facebook, Google and Microsoft increases the perceived importance of VR. This is extended with the use of "from" and "to", suggesting these are not the only companies with an interest in VR. The larger the scope of VR appears, the more important it seems. Highlighting VR as important may increase the interest readers have about the topic, which also relates to the aforementioned hype.

VR is Immersive

Since immersion is one of the main characteristics of VR and a strong focus in VR marketing (see Chapters 1 and 2), it is unsurprising that this was a common theme amongst the articles. VR was often portrayed as immersive by describing VR games experiences, and the prominence of this is demonstrated by the common Applications frame. Moreover, terms in the Immersion category included 'immersion' itself, plus 'interact', 'engaging', 'believable' and 'presence'. Apart from positive and negative words, terms in the Immersion category were the third-most common after New and Important. Out of the entire sample, 65.3% of articles included words in the Immersion category, compared to 92.9% in the New category and 66.4% in the Important category, showing immersion to be one of the most common themes. Words relating to immersion were slightly more likely to appear in articles about dedicated VR devices than mobile devices (67.9% compared to 57.6%). This is to be expected because the high quality dedicated VR devices are known to provide a better sense of immersion.

Since better immersion could connote higher quality, this supports H1.2 which expected dedicated devices to be shown as of higher quality than mobile devices.

Out of all articles, the stem 'immers*' ('immersive', 'immersion', and so on) itself appeared in 34.2% of articles. On the other hand, the term 'presence' only appeared in 4.8% of articles. All but one of these instances in the DA sample mentioned presence in the sense of being in the virtual world rather than other contexts. Though this is still a low number, the sense of presence is connoted by highlighting VR as immersive. DA uncovered that one of the main ways this is achieved is by using the first person or the generic or informal 'you' to describe the VR experience. Articles normally state that 'you' or 'I' do something within the virtual environment, rather than 'the player' does this. For example, the Daily Telegraph frequently used 'you' to describe various VR games:

> [Y]ou explore a mysterious beach, descending into sewers and more as your [sic] search for your sister and her mad scientist pal […] You are a smuggler of sorts, whizzing across abandoned planes on a floating platform. You can move around your gantry, attaching hunks of scrap to form a shield against other players trying to take you out […] You stalk stone halls, taking on undead knights with sword and shield or bow and arrow (Daily Telegraph, 2016).

Using phrases like "you explore", "you are" and "you stalk" implies that 'you' (the user) are actually doing these things, emphasising the idea that VR is immersive and that the user feels present in the virtual world.

Similarly, another article from Mashable focused on the sensations VR can create: "I felt a cold sensation on my upper body as I reached into a virtual refrigerator for some equally virtual cheese" (Rosenberg, 2016). Here, the contrast between the virtual and the actual sensations the writer felt conveys the sense of immersion and

presence as very strong – despite being aware he is in a virtual environment, his body still supposedly reacts to what is happening in the virtual world.

In contrast, this example from Digital Trends shows how the portrayal of immersion is lessened when 'I' or 'you' are not used: "this Oculus Rift game takes advantage of the Oculus Touch controllers, allowing players to cast spells and fight with other 'magicians' in supernatural PVP combat" (Parrish, 2016). Not only does this article state "players" can cast spells, rather than 'you', the quotation marks around "magicians" points out that they are not really magicians, lessening the sense of immersion and presence. However, this is a rare occurrence among the articles (at least those in the DA sample). Thus, the articles most commonly focus on increasing the representation of VR as immersive rather than negating it. This strongly supports H2 which expected immersion to be a major theme within the news discourse.

As was discussed in Chapter 2, it might be assumed that immersion and escapism go hand in hand. However, few words related to escapism were found in the texts. Terms in the Escapism category included 'escape', 'dream' and 'fantasy' and these only appeared in 14.6% of articles. Though few articles appeared to focus on escapism specifically, DA found that one article from the LA Times used escapism as a selling point of VR: "The timing couldn't be better. Whether it's the outcome of the political season or simply the results of October baseball, many of us this time of year may feel the need to don a headset and escape to our own private Disneyland" (Martens, 2016). Not only does this author highlight the escapist qualities of VR, but appears to encourage readers to buy a VR device (in this case, PlayStation VR) by noting reasons the real world currently leaves much to be desired. This encouragement to buy suggests the publication may have something to gain from readers making a purchase, which highlights a potential influence for these positive representations.

Similarly, as well as expecting VR to be represented as escapist, VR was also predicted to be shown as transcendent as this corresponds with VR portrayals in fictional media. However, this was also an uncommon theme. Across the sample, terms in the Transcendence category only appeared in 21.1% of articles. This included words such as 'improve', 'enable' and 'enhance'. The stem 'transcend*' ('transcend', 'transcendent') only appeared three times across the whole sample, and the occurrence of other terms included in the Transcendence category may not actually be connected to this. For example, the most common stem in this category was 'improv*' ('improve', 'improves', and so on) but this appears to be most commonly used to describe the VR technology rather than how VR can improve lives or abilities. For example, CIO claimed Daydream View "made a step-functional improvement in mobile VR" (Patterson, 2016) and *Tom's Hardware* explained that "Samsung's new Gear VR improves upon the first iteration" (Forrest, 2016). In the DA sample, no examples of this stem being used in a transcendent context were found. This highlights just how little the transcendent theme appeared, contrasting with representations of VR in fiction (Chan, 2014).

VR is Social

Despite videogames being a major theme within the sample, the findings from this study differ from media portrayals of videogames in that VR is shown to be social rather than isolating. Though words in the Isolation category (including 'isolating', 'solitary' and 'alone') did appear in some articles, this was limited to 12.5% of the sample. In comparison, words in the Social category (including 'social', 'together' and 'friends') appeared in 53% of articles – over four times as many as in the Isolating category. Portraying VR as social is a much more positive representation than if it was shown to be isolating as videogames are.

Despite this social theme, very few articles actually mentioned VR's use in communication (7.7%). Considering Facebook's involvement with Oculus Rift, this is surprising. However, there is some indication that Mark Zuckerberg's vision of VR does come through in the coverage of Oculus Rift. Communication applications were mentioned in 17.4% of articles about Oculus Rift, the most compared to all other devices (see Table 4.6).

Device	**Google Cardboard**	**Daydream View**	**HTC Vive**	**Oculus Rift**	**PlayStation VR**	**Gear VR 15**	**Gear VR 16**
Mentions	0	4	7	21	2	2	1
(%)*	0	6.5	7.9	17.4	1.3	13.3	3.2

Table 4.6: Number of Mentions of Communication Applications for Each Device

*Percentage of articles out of the number of articles for each device, not out of the number of articles in total because each device had a different number of articles about it.

Moreover, the purely social aspects of VR (such as for social networking) appear to focus on Oculus Rift. Several articles mention how Mark Zuckerberg predicts VR will be the future of social communication. For example, the Independent noted that "Facebook hopes that the Oculus turns out to be the 'future of social networking', which is what boss Mark Zuckerberg called virtual reality earlier this year" (Griffin, 2016). Similarly, the Daily Telegraph mentioned: "Zuckerberg believes virtual reality could be the future of social communication: people may be able to hold meetings or interact with family members on the other side of the world by putting a headset on" (Telegraph Reporters, 2016). While the Independent limits this social use to "social networking", the Daily Telegraph widens this scope by mentioning several different ways VR could be used for communication, making it appear more social.

Apart from instances like these, most other examples of social VR appear in the form of multiplayer videogames. This makes up the majority of social coverage. For example, New Atlas noted: "you need to keep some awareness of your surroundings, or, even better, communicate with your shipmate to make sure all the ship's angles are

covered" (Shanklin, 2016b). When detailing this multiplayer VR game, the author highlights that it is important to communicate with teammates whilst in the game. Further, the social aspect appears strong in this article as the writer states that "[i]t's ultimately a social experience". In a different way, the LA Times shows another VR game to be social with those in actual proximity rather than connected over the Internet: "'Keep Talking and Nobody Explodes' is a simple, engaging bomb-defusing game that invites those not wearing a headset to play" (Martens, 2016). This indicates that the social aspect of VR is portrayed not only as connecting people in different physical locations, but also in the same physical space. The common social theme represents VR positively and shows continuity with the Oculus Rift study (Graves, 2016) and Flanagan's (2014) study of VR in young adult novels.

Negative Representations of VR

Although it seems that the majority of news coverage of VR is positive, there were also some negative portrayals. As mentioned previously, negative words appeared in 70.2% of articles. Furthermore, 31.3% of articles included words in the Ailments category and 39.7% of articles had words from the Issues category. Though these words seem quite common, it is necessary to keep in mind that only 4.2% of articles had either the Risk or Regulation frame. This means, although negative topics were covered in the articles, they were very rarely made the most salient. Nevertheless, negative themes will now be discussed. The majority of negative coverage focused on the price of VR and negative effects of VR such as motion sickness. This, again, differs from coverage of videogames because VR is rarely related to addiction, violence or isolation.

Price

The price of VR devices was mentioned often within the sampled articles. The stem 'pric*' ('price', 'prices', 'priced') was used 407 times in 37.6% of articles. Similarly, the stem 'cost*' ('cost', 'costs', 'costing') appeared 284 times in 29.4% of articles. Amongst these mentions were criticisms of the prices of VR devices, particularly dedicated VR devices. As was shown in Chapter 1, VR devices are sold at a variety of different prices, with PlayStation VR costing the least out of the dedicated VR devices and HTC Vive costing the most. It might be expected that the higher the price of the device, the more negative the representations. However, the DA found that this was not the case. Tech Radar mentioned HTC Vive "will cost an eye-watering £689" (O'Malley, 2016). Though "eye-watering" suggests this is painfully expensive, it is not as strongly negative as this quote about PlayStation VR from The Verge: "Do you want to replace all your worldly possessions with a virtual reality headset, specifically one made by Sony for the PlayStation 4 gaming console?" (Robertson, 2016). Suggesting the reader would have to sell all their possessions to be able to afford PlayStation VR portrays the device as extremely expensive. Despite starting this way, the majority of the article explains how and where readers are able to buy PlayStation VR. This shows that, although VR is seen to be expensive, this is not always used as a way to discourage readers to invest in it. Additionally, the commercial theme in the discourse can be seen once again.

In a different way, DA also found that some articles portray the low-cost devices in a positive light by comparing them to the dedicated VR headsets. Writing about Daydream View, the MailOnline stated: "the Rift and the Vive each costs more than $1,500, once you include powerful personal computers they require. Suddenly, $79 sounds like a bargain" (Prigg, 2016). In itself, comparing $1,500 against $79 makes Daydream View appear very cheap. This is further enhanced with the term "bargain". In

addition, the writer unfairly compares the price of the Daydream View headset on its own (not including the smartphone needed) to the price of the HTC Vive headset plus the cost of the computer required to use it. At the time, the cheapest phone compatible with Daydream View cost £599 (see Chapter 1). Therefore, by conveniently leaving out this detail, Daydream View is portrayed very positively in terms of price comparisons. These examples demonstrate how price is used in both positive and negative contexts. Furthermore, support is found for H1.1 because dedicated devices are criticised more in terms of price than mobile devices are.

Limited Market

Sometimes linked to the cost of VR, the study identified that VR is occasionally portrayed as having a limited market. These are examples of articles that had the Marketplace frame. For instance, somewhat cynically, Inquisitr mentioned: "one has to ask whether virtual reality […] is truly ready for primetime or if we are just looking at advanced gamers being used as the guinea pigs for the rest of us" (Anthony, 2016). Though this is a question rather than a statement, simply asking in this way suggests there is doubt about the range of VR's consumer base. Furthermore, describing "advanced gamers" as "guinea pigs" suggests VR is an experiment and certainly not established. More directly, Fox Business stated: "Right now, VR/AR will be clearly positioned to the niche of gaming enthusiasts who are willing to pay higher prices to adopt the technology early on" (Niu, 2016). Here, this limited market is related to the price of VR. Both of these examples also suggest VR is only used for videogames.

However, there is a contradiction to this limited market idea: some articles also show VR as popular and to have a wide market. In particular, Newsweek headlined one article: "Oculus Rift Isn't Just Coming for Hardcore Gamers; It's Coming for Your Mom Too" (Burningham, 2016). This portrays VR as having a wide audience. The

article ends with the claim "They're going to win over Mom too", however at no point during the actual article does the author make clear how or why VR will target a wider market. In a similar way, the Sun suggested PlayStation VR had a wide appeal: "buy one [PlayStation VR] for the kids for Christmas and you will be playing more than them" (Cutts, 2016). Though this suggests both children and adults would enjoy VR, it still restricts this to gaming by using the "playing" verb. Lastly, Inquisitr began an article with: "Virtual reality is becoming more and more a part of our everyday lives" (Anthony, 2016), making VR seem to be already popular. Moreover, using the collective "our lives" makes this appear even more pervasive as it implies everyone is affected, not just a restricted audience.

PlayStation VR was the device most frequently portrayed as not having a limited market. In fact, the media claim PlayStation VR will make VR mainstream because it is the cheapest high-end VR device and the PlayStation console needed to use it is already owned by millions of people. For example, Wired explained: "where the Oculus Rift and HTC Vive draw on the processing power of a high-end PC, the PSVR runs on Sony's PlayStation 4—more than 40 million of which have sold since the game console's launch" (Rubin, 2016). This highlights the idea (discussed in Chapter 1) that Oculus Rift and HTC Vive are at a disadvantage because more consumers already own the PS4 console that powers PlayStation VR than own high-end PCs required for the other devices. Other publications were quite positive about this. The Daily Beast stated: "PSVR is going to succeed just by virtue of what it is. This is virtual reality for the masses, the thing all of us have been dreaming about for decades" and, finally, ends the article with: "Mass market VR is finally here, and it's incredible" (Kubas-Meyer, 2016). Suggesting everyone has been "dreaming" about mainstream VR for a long time connotes three points: (1) everyone is interested in VR (it does not have a limited market); (2) the word "dreaming" suggests VR is something positive; and (3) stating

that this has been the case for "decades" implies audiences have known about VR for a long time and it has been much anticipated (relating to the aforementioned hype). This is a very positive representation of PlayStation VR in that it can supposedly make VR mainstream.

Ailments and Motion Sickness

Although risks were rarely the main focus of the texts (evident in the lack of the Risk frame), articles did sometimes mention negative effects of VR, such as ailments. Terms related to ailments, including 'sickness', 'headaches' and 'dizzy', were measured in the Ailments category. Though lower than many other word categories, terms in this section appeared in 31.3% of articles. They were significantly more common in articles about dedicated VR devices (36.3%) than articles about mobile devices (16.1%). This shows insight into the differences between portrayals of both devices types (SQ1) by suggesting that the coverage about dedicated VR devices is slightly more critical than other devices. Furthermore, in relation to SQ2 (differences between publications), General news outlets were most likely to mention terms in the Ailments category, whereas Other publications were least likely to mention these. Similarly, over double the percentage of print articles mentioned words in the Ailments category than did online publications (66.7% to 30.4%). This data suggests that print news is more critical about VR than online news, which partly supports H2.2 because it expected generalist outlets to be more negative about VR. However, none of these print articles had the Risk or Regulation frames, showing that even print articles did not attempt to make these negative aspects most salient.

Out of the words in the Ailments category, the stem 'sick*' ('sick', 'sickness') was the most common – used 136 times in 13.4% of articles. The second-most common stem was 'nause*' ('nauseous', 'nausea') with 65 mentions in 9.6% of articles. Thus,

out of any negative effects, it appears VR sickness was the most common. DA uncovered that some examples of sickness within the sample were quite exaggerated. For example, the Daily Mirror headlined one article: "Sony's new PlayStation VR headset 'could lead to EYE DISEASE and VOMITING epidemic', doctor warns" (Curtis, 2016, capitals in original). This headline is designed to shock readers in several ways. First, VR is noted not only to cause sickness, but also eye problems. Secondly, using capitals for the words "EYE DISEASE" and "VOMITING" make them more prominent and draws attention to these negative effects. Thirdly, using the terms "eye disease" and "vomiting epidemic", instead of 'eye strain' or 'sickness', for example, suggests these effects to be very serious and widespread. Lastly, mentioning that this is a "warning" from a doctor seeks to legitimise these claims, since doctors are expected to be a voice of authority on health issues. With all of these aspects combined, this headline is a very negative representation of VR that could even illicit fear amongst readers. If articles like this were common, a moral panic could be created about this issue. However, these types of articles were rare within the corpus and the above example was the most extreme representation of ailments found in the DA sample.

Furthermore, it is notable that most articles focusing on sickness were related to PlayStation VR. As well as the above article, Inverse listed several users' negative experiences with the device in an article titled "Hours After Launch, Playstation VR Is Making People Sick" (Brown, 2016). The article used quotes from users on social media to highlight VR sickness, such as: "Was just sick. Been excited for PSVR for years and I can't play it more then [sic] 15 minutes". Furthermore, this was the only article in the DA sample that alluded to Heim's Alternate World Syndrome (see Chapter 2), stating: "Some [users] reported a strong feeling of disassociation" after using VR. Highlighting VR concerns from the angle of the user instead of the doctor legitimises the claims in another way. Since these are individuals who have actually used the

device, readers may even take these claims more seriously, on the basis of their experience, than those from the doctor in the previous example. However, the article does not appear to encourage readers not to use VR because of these negative effect. In fact, the largest portion of the article lists tips on how to mitigate the feeling of motion sickness to continue using the headset. This shows that, although sickness is mentioned, in the same way as price, it is not always used to discourage readers from using VR.

Some articles even seem to normalise this effect. One journalist stated: "As with any VR headset, there is always the danger of a little motion sickness" (Hoggins, 2016). The beginning of the statement, "[a]s with any headset", portrays this as something affecting all VR devices, so as not to negatively portray PlayStation VR specifically. Additionally, "a little motion sickness" suggests this problem is not very prominent, which is a stark comparison to the article above. Thus, although mentioning VR sickness represents VR negatively, it is not uncommon for articles to gloss over this fact, which could lessen the impact of these negative factors.

Addiction and Violence: the Videogames Comparison

The lack of articles mentioning ailments and the strongly positive representations of VR contrast with media representations of videogames found by Williams (2003), Rogers (2013) and Whitton and Maclure (2015). With such a strong videogame focus amongst the articles, this is surprising in itself. However, the differences do not end there. Though words in the Issues category (e.g. 'problematic', 'dangerous', 'fears' and 'risks') appeared in 39.4% of articles, the most common stem, 'problem*' ('problems', 'problematic'), was used 144 times and is not as strongly negative as, for example, the stem 'danger*' ('dangerous', 'danger), which was only mentioned 53 times. This shows that, unlike with videogames, the media are not trying to create a moral panic surrounding VR.

Even more prominent differences can be found elsewhere. As mentioned previously, videogames are often portrayed negatively by the media, particularly regarding their link to addiction, violence and causing ailments and isolation (Williams, 2003; Rogers, 2013; Whitton and Maclure, 2015). Out of these four, ailments have been found to be the strongest similarity between videogames and VR coverage, as was detailed in the previous section. In addition, this chapter has already explored the lack of isolationist representations of VR amongst the sample, finding that VR is actually mainly shown to be the opposite: social. In the same way, very few references to addiction and violence were found in the sample. Terms relating to addiction appeared in 8.4% of the sample, and those relating to violence appeared in even less (3.6%). Furthermore, no examples relating VR to real-life violence could be found in the DA sample.

On the other hand, covering addiction was slightly more common. In particular, TechCrunch showed concern over the connection between immersion and addiction:

> When do we start talking seriously about VR addiction?
>
> Hopefully now, because it's coming. This thing is immersive. You're not sitting alone in a darkened basement or bedroom staring at a glowing rectangle, acutely aware you're shrugging off the real world. There are no edges. No way to look away. No reminders to stop. Oculus should be researching this now instead of after the first kid dies of dehydration with a Rift still strapped to their face (Constine, 2016).

By highlighting the power of immersion in VR, the author emphasises concern over VR addiction. This is enhanced by the exaggerated consequence that the author suggests will occur if this issue is not addressed ("after the first kid dies of dehydration"). However, like the previous case about VR sickness, this is an extreme example of coverage of VR addiction. For the media to create a moral panic surrounding VR,

instances such as this would be frequent. In actuality, it was more common for articles to allude to VR addiction, though not in a negative way. For example, Engadget predicted: "we have a feeling you won't be coming up for 'air' anytime soon" (Volpe, 2016), suggesting users will want to stay in the virtual world, but with no obviously negative connotations. Similarly, Fortune stated: "fans will never want to leave the virtual world" (Gaudiosi, 2016b). Therefore, though addiction is implied in the sample, it is rarely in a negative context. In fact, these last two examples represent VR positively as it is shown to be so impressive that consumers will want to keep using it. Overall, articles about negative topics such as these are lacking and, at this stage, the media seem much more intent on creating hype about VR than generating fear through a moral panic.

Oculus Rift Negativity

Out of every device, Oculus Rift had the largest percentage of articles with negative words, showing insight into SQ1, which aimed to uncover the differences between representations of each device. The DA uncovered that there seem to be several factors contributing to this, two of which stem from Oculus Rift creator Palmer Luckey and another focusing on concerns over how Oculus Rift users' data is shared with Facebook and other third parties. The seriousness of this topic was shown to be high by mentioning that a US senator later became involved in this discussion. For example, Fortune titled one article: "Sen. Al Franken Takes Aim at Oculus Rift Privacy Policies" (Morris, 2016). Although this is not directly related to the VR experience, it is still a negative portrayal that could have knock-on effects for VR.

Some articles featuring Palmer Luckey also have this effect. For instance, several articles covered the fact that Palmer Luckey helped to fund supporters of Donald

Trump during the 2016 US election campaigns. One of the most critical articles in the sample from the Observer detailed:

> [I]t was reported that Luckey donated $10,000 to the non-profit organisation Nimble America, which operates the Reddit channel r/The_Donald, a place where alt-right memes promoting white supremacy are created and shared in support of Donald Trump's candidacy for president. The news caused a number of developers to withdraw their support for the Oculus Rift and, after a few days, drew a statement from Luckey, posted on Facebook, in which he stated that he was 'deeply sorry' - not for supporting neo-Nazis exactly, but for 'negatively impacting the perception of Oculus' (Parkin, 2016).

As well as portraying Luckey to support Trump, this statement also shows him to support "white supremacy" and "neo-Nazis", representing him in a very negative light. In addition, the author mentions that Oculus Rift had lost support because of Luckey's actions. Though it is mentioned that Luckey apologised, the author ensures to clarify that Luckey did not apologise for "supporting neo-Nazis", but for the effect his actions had on his company Oculus, thus implying Luckey only cares about his product. Each of these factors combine for a very negative portrayal of Luckey, and as a result, a negative portrayal of Oculus Rift.

In addition, a common topic that the news reported on was a statement Luckey made about Oculus Rift not supporting Apple's Mac computers. Article titles included: "Don't Expect Facebook's Oculus Rift on Your Mac Anytime Soon" from Fox Business (Niu, 2016) and "Oculus Rift Does Not Support Macs Because Apple Has No 'Good Computer'" from Inquisitr (Powell, 2016). Both of these articles noted Luckey's statement that Oculus Rift would only support Mac "[i]f they [Apple] ever release a good computer". This appears to show Luckey suggesting Apple does not currently have any 'good computers', which could alienate Apple users or fans from Oculus Rift.

Despite this, articles tend to reduce the negative impact of this statement by mentioning, for example, "Luckey's statements have a lot of truth to them" (Niu, 2016), and continuing to explain why Apple computers are not suitable for VR use. Thus, although choosing to cover this story generates negative portrayals of Oculus Rift, journalists still try to reduce this negativity by at least partly agreeing with Luckey's statement. Therefore, these examples highlight how the sampled articles tend to tone-down or divert attention from negative aspects of VR in favour of positive ones, with only some exceptions.

The Commercial Effect

This chapter has discussed how news media portrayals of VR were mostly positive within the selected sample. These representations could influence readers to view VR positively, particularly as it is a new technology. If readers are affected in this way, they may be more likely to purchase VR devices. Therefore, as has already been outlined with various examples, it seems news coverage encourages readers to buy or use VR. The strongly positive discourse is not the only evidence of this. As mentioned previously, a significant portion of the articles had the Commercial frame (i.e. one that encourages purchases). Additionally, words in the Purchases category (such as 'buy', 'price' and 'store') were extremely common (appearing in 86.1% of articles) and terms referencing retailers were frequently used (432 times in total).

This encouragement to purchase becomes even more obvious when applying DA to the articles. Several articles included lists of the retailers where VR devices can be bought, some even with direct links to online stores (see Appendix 15). Similarly, providing information about how to buy VR devices was also common. The Verge even headlined one article "How to buy a PlayStation VR" (Robertson, 2016). Other articles directly recommended that readers buy a device, such as Wired: "Without a doubt, the

new Gear VR is an improvement over the old one […] The question is whether you should upgrade if you have the older headset. That depends, but the answer skews to 'yes'" (Moynihan, 2016). Some publications were less subtle. Express Online stated: "Express Online can confirm that PlayStation VR is this year's must-have gadget" (Martin, 2016). Therefore, news outlets can be seen to encourage the purchase of VR devices in various ways.

This raises questions about what factors may influence the way the press write about VR. It is possible there are some links between VR companies and the various news outlets included in the sample. However, because there were 69 publications within the sample it is beyond the scope of this project to analyse links between the subsidiaries, parent companies and owners of each of these publications with VR companies. Nevertheless, there are potentially other influencing factors at play here. As mentioned previously, some news outlets may be encouraged to write positively about VR if they were given an early-access device. In addition, it is possible that news companies have some sort of financial incentive to represent VR so positively, such as commission for purchases bought through the links provided on their news sites.

Providing these links is a technique that falls under a type of marketing called 'native advertising'. According to the Interactive Advertising Bureau (IAB), native adverts are "so cohesive with the page content, assimilated into the design, and consistent with the platform behavior that the viewer simply feels that they belong" (2013, emphasis in original). There are various types of native advertising and IAB terms the type that embeds links in the body of an article as 'in-feed ads' (Interactive Advertising Bureau, 2013). Several examples of this were found within the sample, one of which can be seen in Appendix 16. This publication also had a statement on their website notifying readers that they gain some money every time someone makes a purchase after clicking one of these links. Though it cannot be certain whether all news

outlets are paid for linking to external websites, one must question what other motive they would have to do this if not a financial one. Therefore, the profit-making agendas of some publications may have influenced the way they write about VR and could be one reason representations of VR appear strongly positive.

Importantly, these results also suggest that journalistic integrity is not consistently maintained throughout news coverage of VR. The National Union of Journalists sets out rules in its code of conduct, which journalists in the UK are supposed to follow. One point is that a journalist "[d]oes not by way of statement, voice or appearance endorse by advertisement any commercial product or service" (National Union of Journalists, 2013). In light of the common encouragement to purchase VR devices, it appears the writers of VR news stories have not adhered to this point in particular. Similarly, the Society of Professional Journalists have their own code of ethics for US journalists. One of their statements it that journalists should "[d]istinguish news from advertising and shun hybrids that blur the lines between the two" (Society of Professional Journalists, 2014). The aforementioned native advertising does exactly the opposite of this by making it unclear what is news and what is advertising. This is a way in which news coverage of VR does not seem to conform to journalistic standards, and is mirrored by Riordan's finding that native advertising threatens "the editorial standard of independence" (2014: 27). While it is unclear whether the authors of the sampled articles are professional journalists or amateur contributors, it is worth considering the repercussions of writing about VR in a way that does not conform to journalistic guidelines. This is concerning because the codes of practice are put in place to maintain fair, ethical and sound news stories.

This chapter has discussed the findings from the study and provided insight into each research question. The next chapter brings the thesis to a close by directly

answering these research questions, highlighting how the project has contributed to existing research fields and recommending areas for further study.

Chapter 5: Conclusion

This thesis has examined news representations of VR, focusing on the six most prominent VR devices at this point in time: Google Cardboard, Google Daydream View, Samsung Gear VR, Oculus Rift, HTC Vive and Sony PlayStation VR. Content and Discourse Analysis have been applied to a wide range of UK and US news articles in print and online publications to address the overarching research question: how is VR represented in the news?

Addressing the Research Questions

Several notable themes and trends emerged from the study. Firstly, regarding the overall RQ of how VR is represented in the news, it was found that positive portrayals were most common, despite very few articles having the Benefits frame. Instead of focusing on benefits of VR, positive portrayals of VR were found in the common use of positive terms over negative ones, as well as by showing VR to be revolutionary, exciting, important, immersive, social, advanced and high quality technology and by generating hype for VR. Furthermore, creators and owners of VR devices were the most common source used within the news articles. By prioritising these sources, the press has allowed them to become primary definers of VR topics and, since they are invested in VR being successful, their comments maintain this usually positive coverage.

On the other hand, some negative themes were present. The price of VR devices, particularly dedicated VR devices, was often criticised throughout the sample. Similarly, mentioning the motion sickness VR can cause was common. Still, journalists mostly tried to normalise this instead of using the issue to create a very negative representation of VR, or perhaps even a moral panic. Lastly, though in some cases VR was portrayed as popular, the press more often criticised VR for having a limited market. This usually involved claiming that VR is currently only targeted towards

videogame players. However, these issues were not normally used to discourage readers from investing in VR. Very few articles had Risk or Regulation frames, showing that these negative aspects were rarely made the most salient in a text. Therefore, the findings support H1, which expected positive themes to be more prominent than negative themes.

Rather than highlighting negative aspects of VR, the frames analysis showed that articles most commonly focused on VR applications. Moreover, the most frequently mentioned application was Videogames. This shows that the sample emphasised VR's use in entertainment rather than other areas. Additionally, the way journalists wrote about VR videogames made the technology appear very immersive. This supports H2 as it was expected immersion would be a strong theme within the discourse.

Despite the strong videogame focus, VR was represented very differently to videogames. Whereas the media typically portray videogames as isolating, addictive and related to real-life violence (Williams, 2003; Rogers, 2013; Whitton and Maclure, 2015), these concerns rarely appeared in news coverage of VR. In fact, VR was actually represented as social. Therefore, news representations of VR differ quite drastically from media representations of videogames. On the other hand, the strongly positive coverage of VR coincides with fictional representations of VR (Chan, 2014) and news representations of other emerging technologies (Lewenstein, Gorss and Radin, 2005) as discussed in Chapter 2.

Regarding the differences between representations of each device examined in SQ1, the attention the media gave to individual VR devices varied quite dramatically, with some devices being written about much more than others. Between the two device types, dedicated devices were reported on significantly more than mobile devices and representations per device differed slightly. Oculus Rift was shown to be the device that started the current VR trend but also suffered slightly negative representations mostly

due to Palmer Luckey's actions. Differently, PlayStation VR was shown to be the VR device that would make VR mainstream. HTC Vive was portrayed as the most advanced VR device out of the sample, whereas Cardboard was shown to be the least advanced, though it was still represented positively in terms of its simplicity. Since there were two versions of Gear VR analysed, coverage mainly focused on how the second device improved on the first. Apart from this, there were few differences between representations of mobile and dedicated VR devices. As mentioned, price was a negative theme, which usually focused on dedicated VR devices. This supports H1.1 as it was expected that dedicated devices would be criticised in terms of price more so than mobile devices. Similarly, as H1.2 predicted, dedicated devices were represented as high quality and advanced technology more so than mobile devices.

Moreover, SQ2 focused on the differences in representations of VR between publication types. In answering this question, some differences were found, though these were not what were originally expected. H2.1 and H2.2 predicted that general news outlets would be more negative or critical about VR than technology specific outlets. However, the opposite was actually found within the sample, with positive themes being slightly stronger in general publications than technology-specific publications. The exception to this was print articles, which were more critical of VR than online articles. Additionally, there were very few print articles covering these devices, suggesting that mass media outlets do not yet value VR very highly. Therefore, H2.1 and H2.2 are mostly disproved, with the exception of print articles.

Lastly, it was found that there may be various contributing factors to this mostly positive coverage of VR. Several online articles included links to VR company websites or retailers where readers could buy the devices. This seems to be a form of 'native advertising' (Interactive Advertising Bureau, 2013), meaning journalists may write positively about VR to encourage people to click on these links and buy the products.

Similarly, many journalists appear to have been given an early-access version of some VR devices. If this is the case, they may be influenced to give a positive review of the product after receiving the privilege of having the product before its release. This raises concerns as to whether the press follow journalistic guidelines such as not endorsing products or services.

Limitations and Future Research

Though the research questions were addressed sufficiently, there is still scope for further research. One of the limitations of this study is that it focused on six VR devices to analyse representations of VR. Since there are other VR devices and other forms of VR, it would be beneficial to analyse the news representations of VR in general to get a broader understanding of how the media report on VR. This could perhaps take the form of a comparative study between news representations of VR and augmented reality.

Moreover, news representations were measured during the release periods of each device. Future studies would benefit from analysing news representations over a longer period to see whether there are changes in the discourse over time. This would better address, for example, whether VR news coverage relates to Gartner's Hype Cycle, which is important in uncovering how VR relates to other emerging technologies.

Analysing other forms of news media, such as television broadcasts, could also complement the material analysed in future samples. This would be particularly useful in relation to VR because it is much easier to convey the VR experience – particularly its immersive capabilities – using sounds and visuals than it is with written words. Therefore, it might be that news broadcasts highlight VR immersion even more so than the written articles in this study.

Other limitations became apparent when analysing the data. The fact that there were few statistical differences found between coverage of both types of VR devices could have been because most articles included information about more than one VR device. Therefore, all the words found within one article did not necessarily relate to the device that appeared in its headline. Future studies focusing on the differences and/or similarities between VR devices would benefit from a more in-depth examination of each article such as distinguishing which sections related to which device and analysing these separately.

Lastly, it was difficult to determine the differences between print and online coverage of VR because there were only 12 related print articles published during the sampled period. Though this is noteworthy in itself, it would be beneficial to analyse a larger number of print articles by increasing the sample period. This would uncover whether print coverage of VR remains different (and perhaps more critical) from online coverage as was found in this study.

In addition, there are three other notable areas for future related research. Firstly, because some of the strong themes in news media representations of VR are also present in VR marketing (e.g. immersion), it would be worth exploring further the connection between these two discourses. For instance, whether VR press releases and marketing themes appear in VR news coverage. Furthermore, additional research should be carried out regarding the connection between VR companies and news companies to find out if these relationships influence VR coverage. Lastly, although other studies have shown that the media can affect public opinion and legislation of new technologies (Marwick, 2008; Brewer and Barbara, 2010; Rogers, 2013), none of these focus on VR. It would therefore be beneficial to research the impact that media discourse (particularly within news) has upon VR consumers and the general public. This would further highlight the importance of researching media representations of new technologies.

Areas of Contribution

This is the first study that has focused on representations of VR within the news specifically. From an academic perspective, this study has made a methodological contribution by implementing a novel approach to analysing terms within texts, using a word counter rather than searching for individual words based on the researcher's pre-conceived possibilities. This approach or a similar one could be used in future studies to avoid the limitations of using a set coding sheet to find specific word appearances.

Additionally, this study has contributed not only to research about VR but also media representations of emerging technologies, wearable devices and new media platforms in general. Similarly, analysing these representations contributes to journalism studies by taking a critical stance on the relationship between the press, the products they write about, and the influence this may have upon the general population.

In this way, from the perspective of the general public and VR users, the study highlights that news coverage of VR (and other emerging technologies) should be read with a critical eye. It should be kept in mind that there could be various factors that influence coverage of these technologies, which could sway journalists to be more or less positive in their writing. Moreover, the findings may spur journalism regulators (like the Independent Press Standards Organisation in the UK) to monitor such coverage and practices more tightly when considering the impact they can have on public perceptions.

Overall, this study has made an original contribution to research by analysing news representations of VR within print and online news from the UK and US. It has contributed to several research areas with the aim to inspire future studies on representations of VR, new media platforms and emerging technologies within the news and other media forms.

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Appendices

Appendix 1: Sentiment Analysis Test

	A	B	C	D[1]
1	61.3 (quite positive)	Neutral: 0.1, polar: 0.9 **Pos: 0.5**, neg: 0.5	Neg (confidence level: 92.5917)	100% (very positive)
2	-35.9 (somewhat negative)	**Neutral**: **0.8**, polar: 0.2	Pos (confidence level: 99.9913)	78% (positive)
3	-0.2 (neutral)	Neutral: 0.3, polar: 0.7 Pos: 0.5, **neg: 0.5**	Neutral (confidence level: 51.7651)	98% (very positive)
4	44.4 (somewhat positive)	Neutral: 0.2, polar: 0.8 **Pos: 0.8**, neg: 0.2	Pos (confidence level: 90.0847)	100% (very positive)
5	15.2 (somewhat positive)	Neutral: 0.2, polar: 0.8 Pos: 0.4, **neg: 0.6**	Neg (confidence level: 99.0794)	65% (somewhat positive)
6	70.3 (quite positive)	**Neutral: 0.8**, polar: 0.2	Pos (confidence level: 94.8492)	3% (very negative)
7	29.0 (somewhat positive)	**Neutral: 0.5**, polar: 0.5	Pos (confidence level: 99.9040)	41% (somewhat negative)
8	89.7 (very positive)	Neutral: 0.2, polar: 0.8 **Pos: 0.5**, neg: 0.5	Pos (confidence level: 95.3592)	27% (quite negative)
9	-68.9 (quite negative)	**Neutral: 0.9**, polar: 0.1	Pos (confidence level: 100)	1% (very negative)
10	99.6 (very positive)	Neutral: 0.5, polar: 0.5 **Pos: 0.7**, neg: 0.3	Pos (confidence level: 99.9966)	100% (very positive)

[1]This tool had a word limit so some articles could not fit fully

Sentiment Analysis Tools:

A: http://www.danielsoper.com/sentimentanalysis/

B: http://text-processing.com/demo/sentiment/

C: http://sentiment.vivekn.com/

D: https://text-analytics-demo.azurewebsites.net/

Each tool clarified sentiments in slightly different ways as shown in the table above. Though tools A and D both used terms such as ‘somewhat positive’ to describe the numerical value, tool A used a scale from -100 to +100 with 0 being neutral and tool D used a scale from 0 to 100% with 50% being neutral. Tool B measured both neutrality and sentiment from 0 to 1. This tool only measured positive and negative sentiments if

polarity (i.e. instances that have positive/negative sentiments) was judged to be more than or equal to neutrality (i.e. the text is neither positive nor negative), which is why some fields in the table do not include positive and negative figures. The strongest sentiment in the articles according to tool B are marked in bold. Lastly, tool C simply gave a positive or negative verdict with a confidence level which reflects how certain the tool is that the judgement is correct.

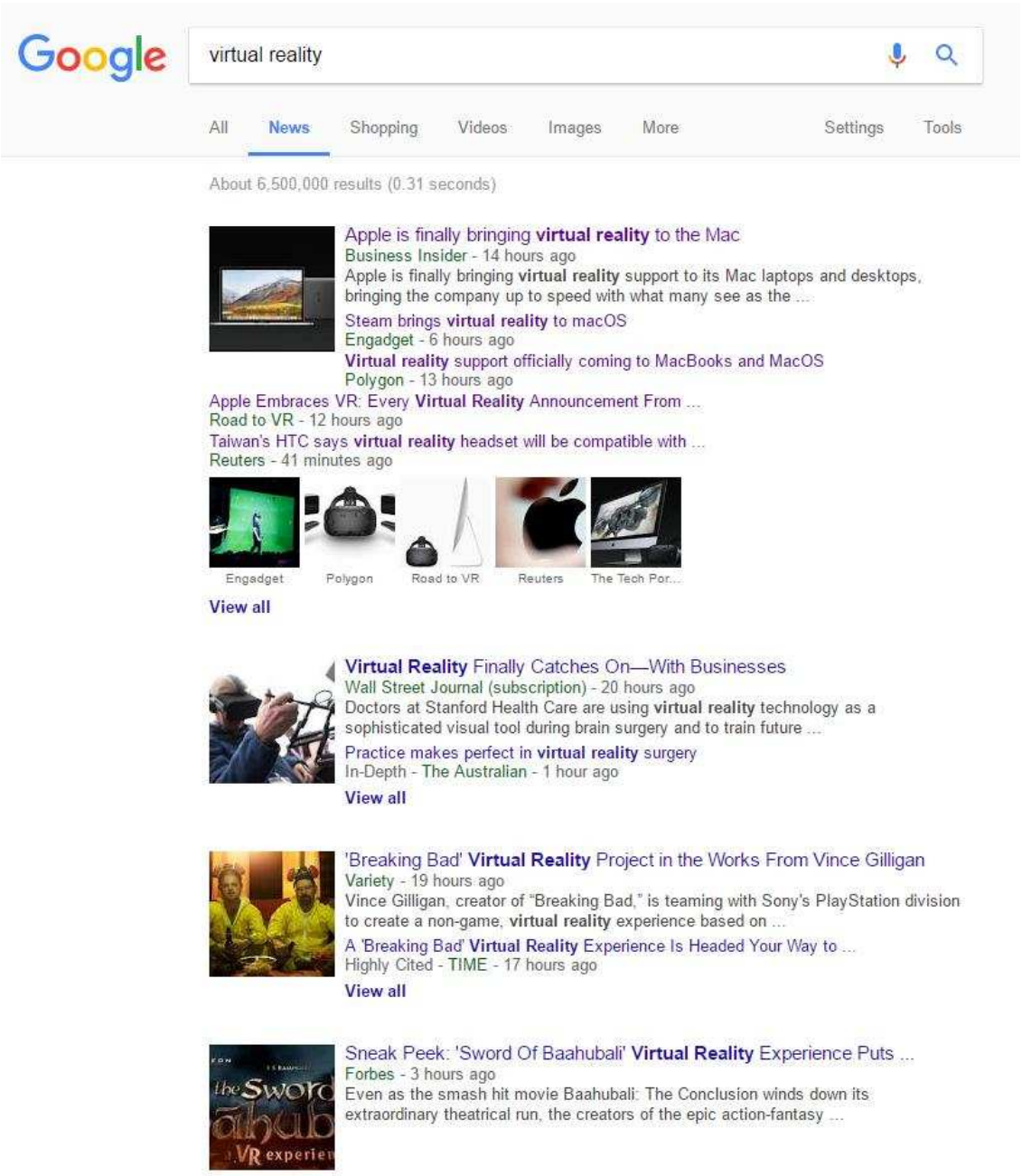
Analysed Articles:

1. Cruz, S.P.D. (2016) 'Oculus Rift Price: Lower than HTC Vive, Higher than PlayStation VR; Rift Upgrades Roll Out in December?', University Herald, 10 October. Available at: http://www.universityherald.com/articles/43479/20161010/oculus-rift-price-oculus-rift-games-oculus-rift-review-oculus-rift-vs-vive-oculus-rift-dk2-oculus-rift-stock-oculus-rift-amazon.htm (Accessed: 8 November 2016).
2. Gilbert, B. (2016) 'Facebook just showed off the new Oculus Rift', Business Insider, 7 October. Available at: https://www.businessinsider.com.au/oculus-rift-2-2016-10 (Accessed: 8 November 2016).
3. Pot, J. (2016) 'Virtual Reality Is The New Canvas: Oculus Shows Off Medium Sculptures', Digital Trends, 23 July. Available at: https://www.digitaltrends.com/virtual-reality/oculus-shows-off-oculus-medium-3d-sculptures/ (Accessed: 8 November 2016).
4. Strange, A. (2016) 'Oculus Rift goes on sale on Best Buy site, immediately sells out', Mashable, 25 May. Available at: http://mashable.com/2016/05/25/oculus-best-buy/ (Accessed: 8 November 2016).
5. Wagner, K. (2016) 'The First Batch of Oculus Rift Virtual Reality Headsets Finally Shipped', Recode, 24 March. Available at:

https://www.recode.net/2016/3/24/11587254/the-first-batch-of-oculus-rift-virtual-reality-headsets-finally (Accessed: 8 November 2016).

6. Lee, K. (2015) ‘Oculus Rift is finally a finished product’, TechRadar, 22 December. Available at: http://www.techradar.com/news/wearables/oculus-rift-is-finally-a-finished-product-1311701 (Accessed: 8 November 2016).
7. Kuchera, B. (2016) ‘Here's what the Oculus Rift's included remote can and can't do’, Polygon, 8 January. Available at: https://www.polygon.com/2016/1/8/10736212/oculus-rift-remote-capabilities (Accessed: 8 November 2016).
8. Press Association (2016) ‘Virtual becomes reality as Oculus Rift arrives in the UK’, Guardian, 20 September. Available at: https://www.theguardian.com/technology/2016/sep/20/virtual-becomes-reality-as-oculus-rift-arrives-in-the-uk (Accessed: 8 November 2016).
9. Allan, D. (2016) ‘Oculus Rift looks to beat HTC's Vive at room-scale VR’, TechRadar, 26 July. Available at: http://www.techradar.com/news/wearables/oculus-rift-looks-to-beat-htc-s-vive-at-room-scale-vr-1325410 (Accessed: 8 November 2016).
10. Robertson, A. (2016) ‘I built a beautiful VR avatar in the Oculus Rift’, The Verge, 6 October. Available at: http://www.theverge.com/2016/10/6/13191240/oculus-connect-3-rift-virtual-reality-avatars-hands-on-video (Accessed: 8 November 2016).

Appendix 2: Google Search for 'virtual reality' on 06/06/2017

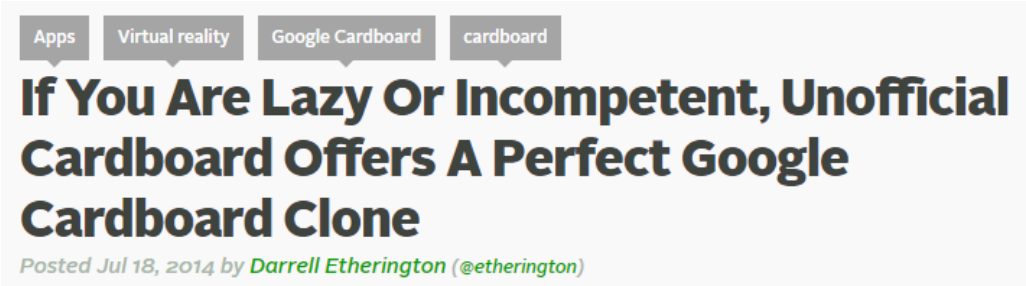


This Google search returned articles from UK and US publications.

Appendix 3: Coding Sheet Fields

Article No.	Date Published	Publication	Online/ Print	UK/ US	Section/ Tags	Article Title	Byline	No. of Words	Frame

These fields were filled in for every article within the sample. The 'Section/Tags' field was filled in differently depending on the specific article. To explain, some articles published online were not shown to be in a specific section within the website. Instead, some articles had 'tags' rather than sections. This consisted of several words relating to the article itself. For instance, in the screenshot below the article uses tags (highlighted in grey) rather than being placed within a certain section of the website. If no section was visible, the tags were recorded. It was also possible for articles to use tags and sections. In these cases, the section was recorded.



Source: Etherington, D. (2014) 'If You Are Lazy Or Incompetent, Unofficial Cardboard Offers A Perfect Google Cardboard Clone', Tech Crunch, 18 July. Available at: https://techcrunch.com/2014/07/18/if-you-are-lazy-or-incompetent-unofficial-cardboard-offers-a-perfect-google-cardboard-clone/ (Accessed: 24 June 2017).

Some online articles were updated after the date they were initially published. If the updated part of the article was in a section that was clearly labelled and the date was either not mentioned or the date was outside the sample period, this part of the article was removed to ensure all data analysed was consistently within the sample period. Articles that were updated during the relevant sample period were included in the form they were found during the sample collection.

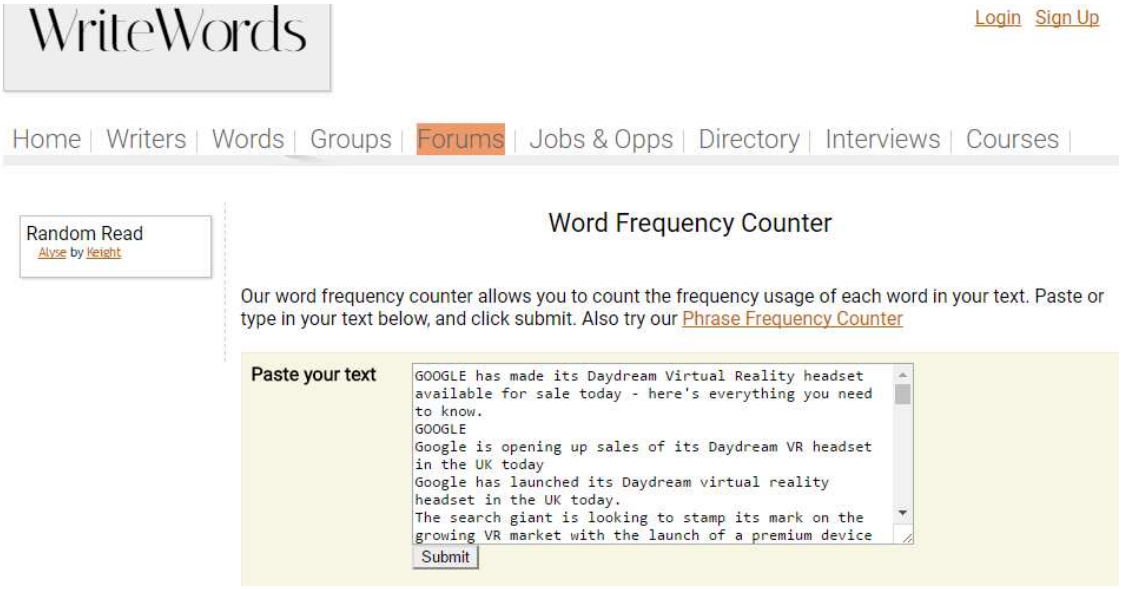
Appendix 4: Classification of VR Applications

Application	Description
Architecture	Designing buildings or exploring a virtual design of a building/complex.
Arts & Culture	Visiting a virtual museum and/or examining artefacts or using VR for a real-life exhibition/installation.
Communication	Social interaction between users in a virtual world, or using social media platforms within VR.
Data Visualisation	Visualising, understanding and analysing data.
Design	Creating artwork, 3D environments and models.
Education	Learning/teaching through VR for both children and adults in and outside of a school environment.
Film/TV/Video	Watching films, television and videos on various platforms such as YouTube.
Health Care	Improving health and/or life quality such as using VR as a rehabilitation tool or to overcome phobias.
Marketing	Promoting products, services or causes, such as a simulation of being involved in a car accident to encourage people to drive safely.
Military	Military training, such as battle simulations and flight simulations specifically for military use.
Music	Creating music or virtually attending a music event, such as a live concert.
News	Viewing news.
Pornography	Viewing pornographic content in VR which may or may not include additional sensors/accessories to make the experience more realistic.
Product Development & Testing	Simulating how products in development will work/react in certain conditions so that they can be tested without real-life risk.
Real Estate	Virtually looking around a home and surrounding areas without having to physically visit the area.
Research	A wide range of research purposes, such as a person's reaction to something they are viewing in VR, or how using VR can impact its users.
Retail	Viewing and purchasing products in a virtual store setting.
Science	Examining scientific phenomena, trends and developments.
Simulator	Simulations for entertainment purposes, such as Job Simulator which allows users to try out several different jobs with a comedy focus.
Sport	Virtually attending past and live sports games, or going behind the scenes to find out more about a sports team or game. This does not relate to playing sport inside VR – these applications were classed as Videogames.
Tourism & Travel	Promoting travel destinations by letting users virtually visit them or simply explore various parts of the world using apps such as Google Earth VR.
Training	Training users in various skills/trades such as driving and carrying out surgeries (does not include training for a military purpose).
Videogames	Any videogame accessible in, or made for, VR.

Appendix 5: Classification of Source Types

Source Type	Description
Company Owners/Device Creators	The creators or owners of the VR device in question. Importantly, this criteria changed per sample period. For example, the owners of Google Cardboard are Google. If Google or its connected people were sourced *during Google Cardboard's sample period*, this quote was put in this category. In the same way, if Oculus VR or Facebook were sourced *during Oculus Rift's sample period,* this quote was also put in this category. However, if Google was sourced during Oculus Rift's sample period, this quote was put in the category: Other Owners/Creators (see below).
Consumers	Current or soon-to-be-consumers of VR.
Content Creators	People who have created content specifically for VR.
General Public	The general public – specifically people who have not used VR.
Investors	Potential or actual investors of one or more VR device or company.
Other Industry Specialists	Experts of industries other than VR and technology, such as scientists and doctors.
Other Owners/Creators	Owners or creators of a VR device other than the device the sample period corresponds to.
Other Publishers	An article quoting/citing another news article by a publication other than the one that the quote/citation appeared in.
Researchers	Researchers or analysts from research consultancies, including the company itself, or research divisions within a company.
Retailers	Companies that sell VR devices.
Technology Industry Specialists	Experts in the wider technological field, such as a Microsoft employee.
VR Industry Specialists	Specialists in the VR field, such as someone who is the head of VR within their company, but who does not own one of the VR devices in the sample.
Not Specified	A quote/citation that is not referenced so it is unclear who or what it is from.
Other	A quote/citation that does not fit in to any of the above categories.

Appendix 6: WriteWords Word Frequency Counter Process



The first stage was to copy and paste the article text into the word frequency counter as seen in the above screenshot. Pressing "Submit" results in all words being displayed in a list from those with the most to least mentions. The start of this list can be seen in the screenshot below. This was carried out for every article.

Source: http://www.writewords.org.uk/word_count.asp

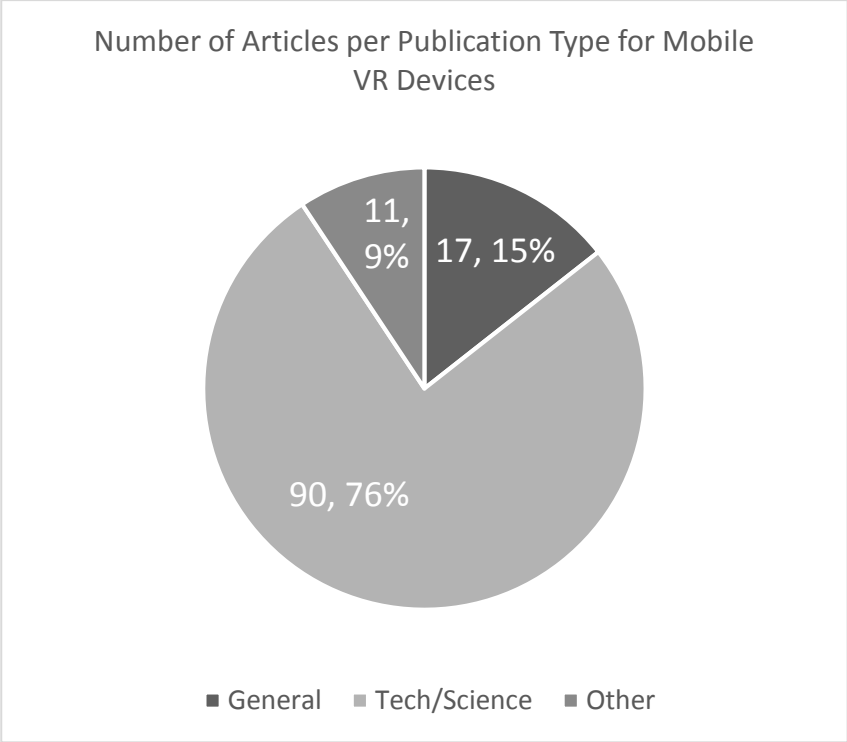
Appendix 7: Number of Articles per Publication for Each Device

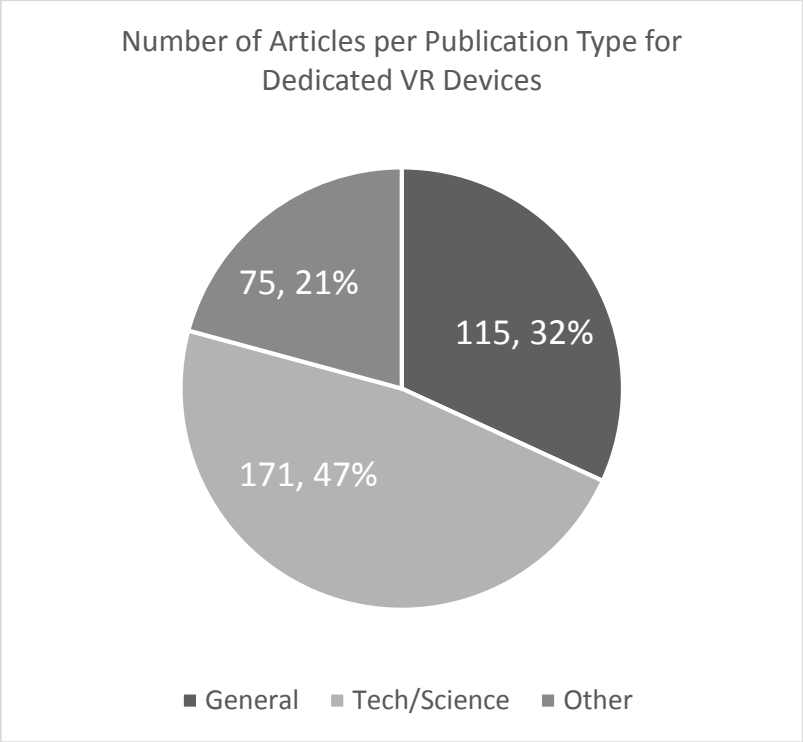
Device code: GC = Google Cardboard, DV = Daydream View, HV = HTC Vive, OR = Oculus Rift, PS = PlayStation VR, G15 = Gear VR 2015, G16 = Gear VR 2016.

Publication	Type	GC	DV	HV	OR	PS	G15	G16	TOTAL
TechRadar	Tech/Science	1	1	9	7	11	4	2	35
Digital Trends	Tech/Science	0	1	6	8	12	0	7	34
Engadget	Tech/Science	1	5	8	8	5	0	4	31
CNET	Tech/Science	1	5	2	12	5	0	0	25
Trusted Reviews	Tech/Science	0	2	4	1	8	6	4	25
VG247	Gaming	0	0	9	1	14	1	0	25
TechCrunch	Tech/Science	2	5	2	5	2	0	1	17
The Verge	Tech/Science	0	5	3	4	4	0	1	17
Daily Mirror	General	0	3	3	2	7	0	0	15
Independent	General	1	1	2	2	7	2	0	15
Express Online	General	0	1	0	1	12	0	0	14
Forbes	Business	0	0	7	4	3	0	0	14
Fortune	Business	0	0	6	7	0	0	0	13
Inquisitr	General	0	3	3	3	3	0	1	13
Metro	General	0	0	4	1	8	0	0	13
New Atlas	Tech/Science	0	0	7	4	0	0	1	12
Mashable	Digital	1	3	3	1	1	0	1	10
Ars Technica	Tech/Science	0	0	1	3	4	0	1	9
Gizmodo	Tech/Science	2	0	1	4	1	0	0	8
Daily Telegraph	General	0	0	2	2	2	1	0	7
MailOnline	General	0	1	1	2	2	1	0	7
Popular Science	Tech/Science	0	1	1	3	1	0	1	7
Wired	Tech/Science	0	0	1	1	3	0	2	7
PC Mag	Tech/Science	0	3	0	0	3	0	0	6
Sun	General	0	0	1	0	5	0	0	6
Time	General	0	0	1	4	1	0	0	6
Tom's Hardware	Tech/Science	0	3	0	0	0	0	3	6
Variety	Entertainment	0	3	0	1	1	0	1	6
Entertainment Weekly	Entertainment	0	0	0	3	2	0	0	5
Tech Times	Tech/Science	0	5	0	0	0	0	0	5
Newsweek	General	0	0	0	4	0	0	0	4
CNBC	Business	0	0	0	2	1	0	0	3
CNN	General	0	0	0	3	0	0	0	3
Fox Business	Business	0	1	0	2	0	0	0	3
Guardian	General	0	1	0	1	1	0	0	3
i	General	0	1	0	1	1	0	0	3

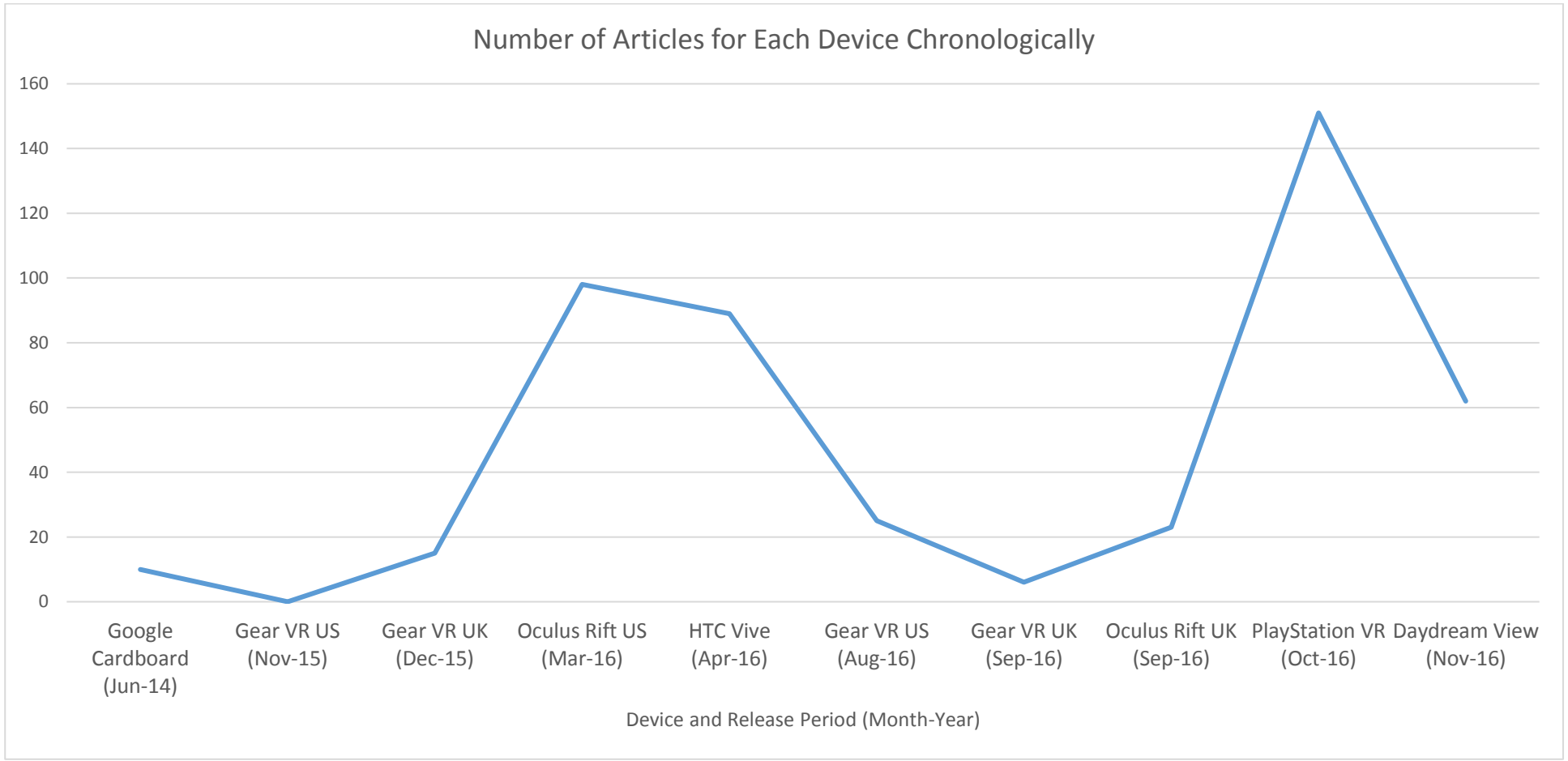
Inverse	Tech/Science	0	0	0	0	3	0	0	3
PC Advisor	Tech/Science	0	0	0	1	2	0	0	3
Yahoo	General	0	0	1	2	0	0	0	3
Bloomberg	Business	0	0	0	0	2	0	0	2
Hollywood Reporter	Entertainment	0	0	0	1	1	0	0	2
Mercury News	General	0	0	1	0	1	0	0	2
New York Daily News	General	0	0	0	0	2	0	0	2
PC World	Tech/Science	0	1	0	0	0	0	1	2
The Sunday Times	General	0	0	0	0	2	0	0	2
Venture Beat	Tech/Science	0	2	0	0	0	0	0	2
ZDNet	Tech/Science	0	2	0	0	0	0	0	2
Breitbart	General	0	0	0	1	0	0	0	1
CIO	Tech/Science	0	1	0	0	0	0	0	1
CSMonitor	General	0	0	0	1	0	0	0	1
Daily Beast	General	0	0	0	0	1	0	0	1
Daily Star	General	0	0	0	0	1	0	0	1
Denver Post	General	0	0	0	0	1	0	0	1
eWeek	Tech/Science	0	1	0	0	0	0	0	1
Financial Times	Business	0	0	0	0	1	0	0	1
Fool	Business	0	0	0	0	1	0	0	1
Fox 5	General	0	0	0	1	0	0	0	1
Gigaom	Tech/Science	1	0	0	0	0	0	0	1
Hackaday	Tech/Science	0	0	0	1	0	0	0	1
Huffington Post	General	0	0	0	1	0	0	0	1
IT World	Tech/Science	0	1	0	0	0	0	0	1
LA Times	General	0	0	0	0	1	0	0	1
Observer	General	0	0	0	1	0	0	0	1
Orange County Register	General	0	0	0	1	0	0	0	1
Reuters	General	0	0	0	0	1	0	0	1
SFGate	General	0	0	0	1	0	0	0	1
Star-Telegram	General	0	0	0	0	1	0	0	1
The Hill	Politics	0	0	0	1	0	0	0	1
US News	General	0	0	0	1	0	0	0	1

Appendix 8: Number of Articles per Publication Type for Mobile and Dedicated VR Devices

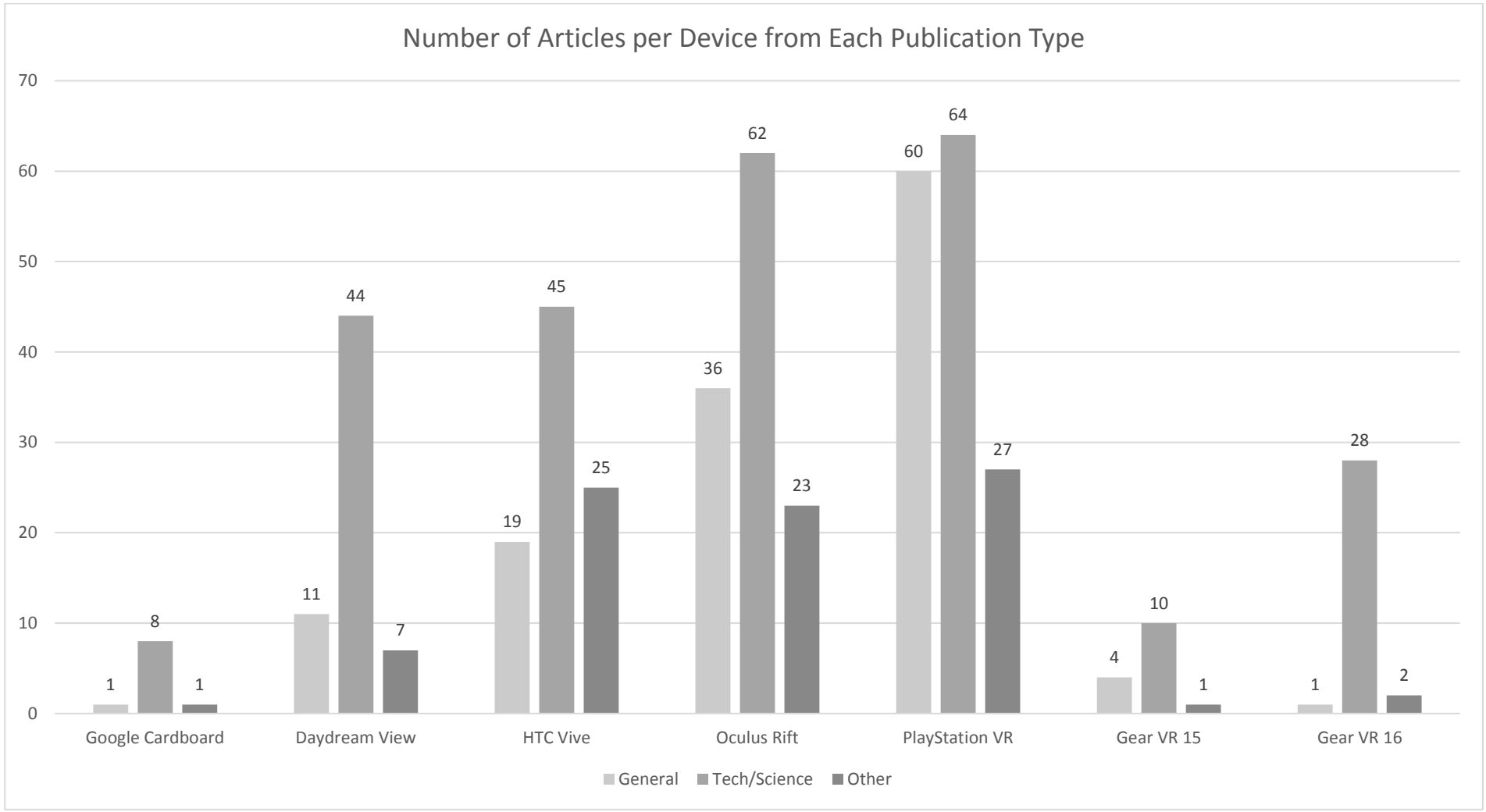




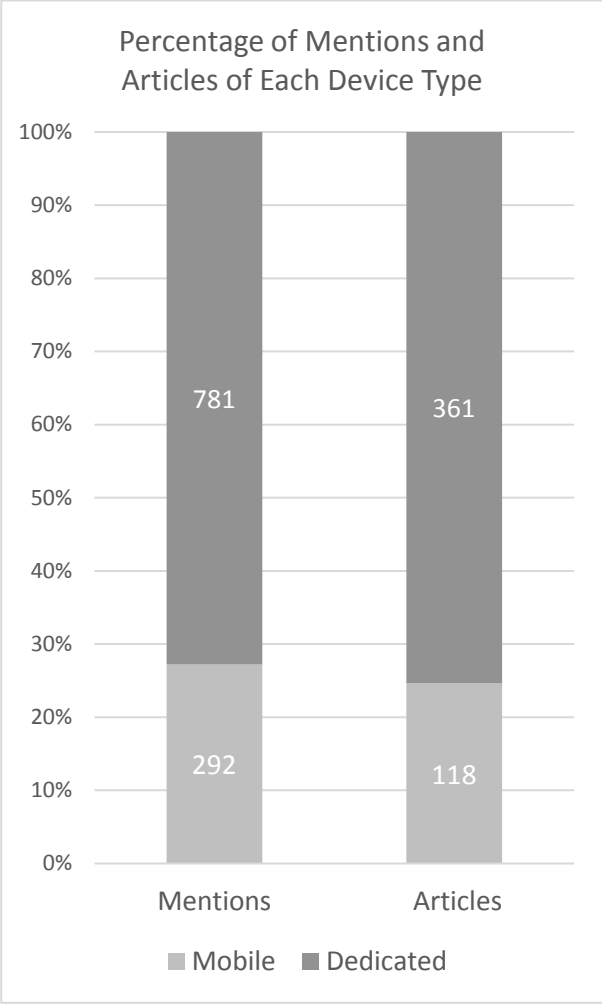
Appendix 9: Number of Articles in the Sample during Each Device's Release Date (Chronological)



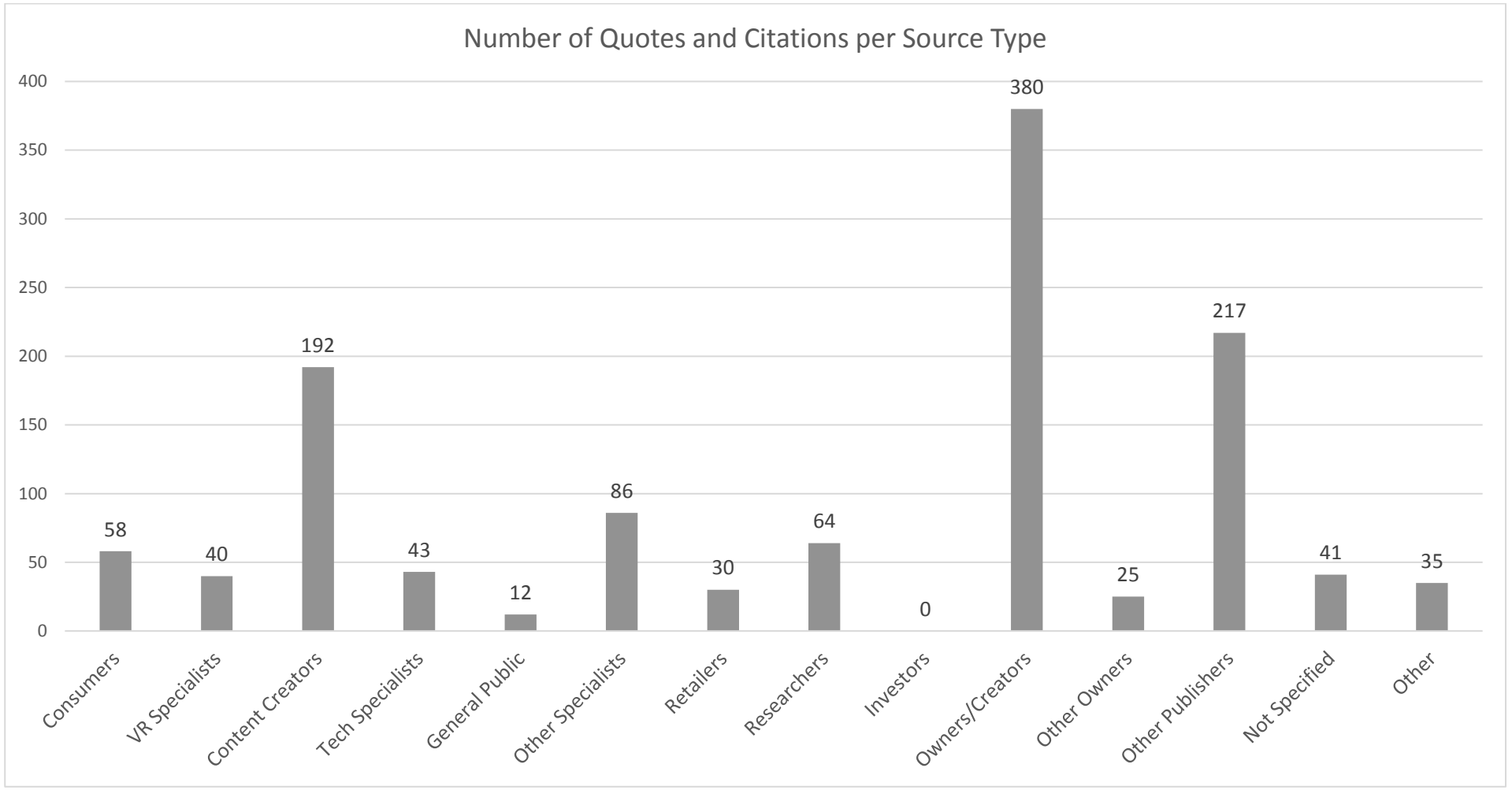
Appendix 10: Number of Articles from Each Publication Type per Device



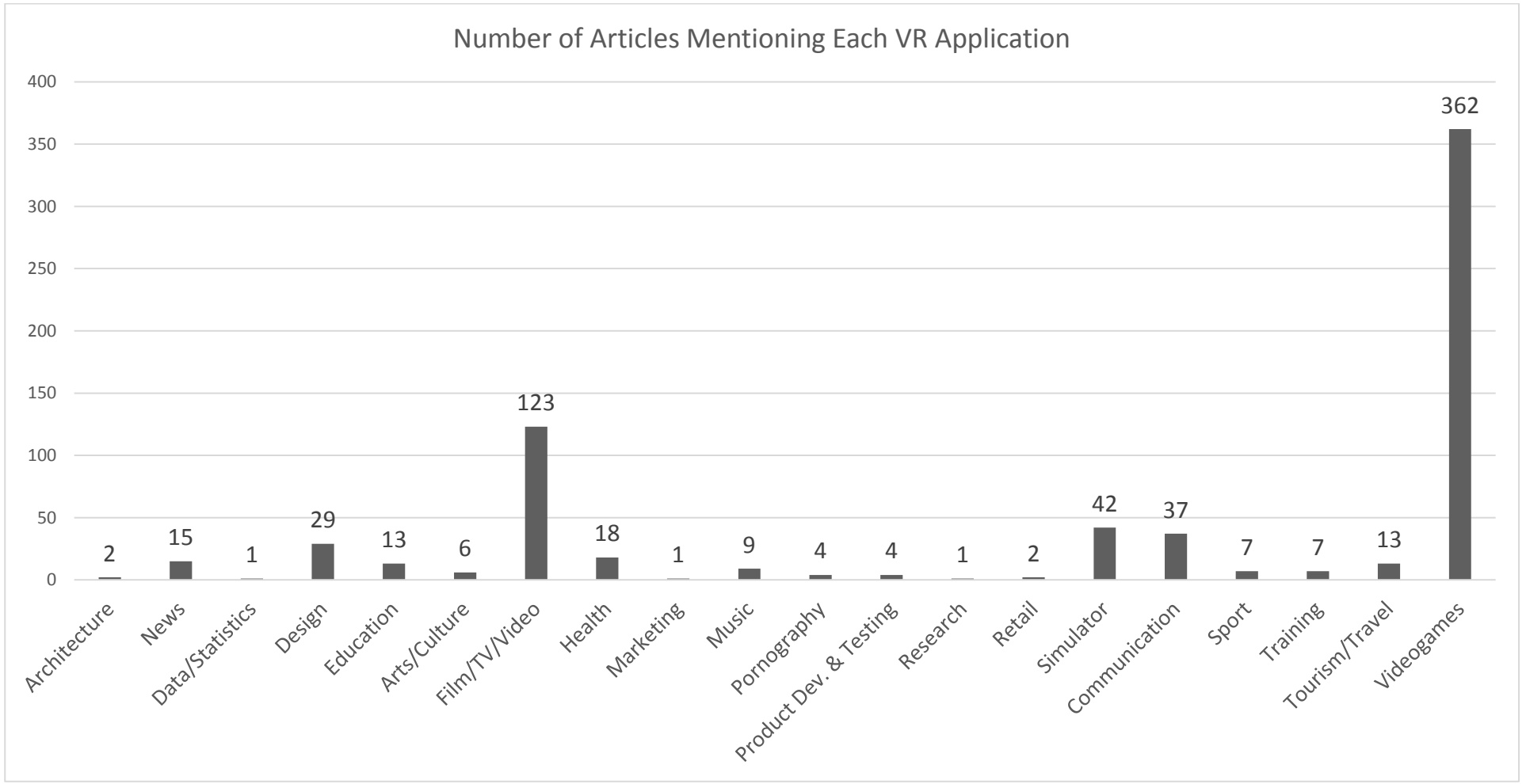
Appendix 11: Percentage of Mentions and Articles of Mobile and Dedicated VR Devices



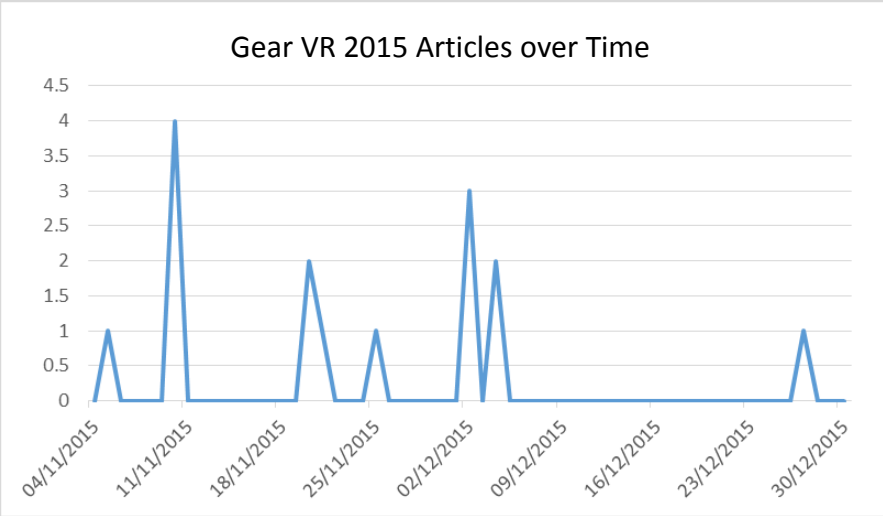
Appendix 12: Number of Quotes or Citations by Source Type

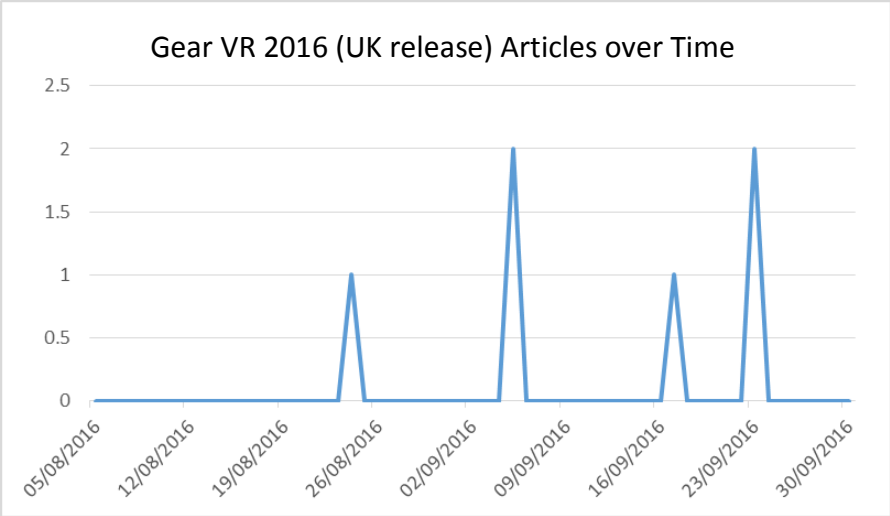


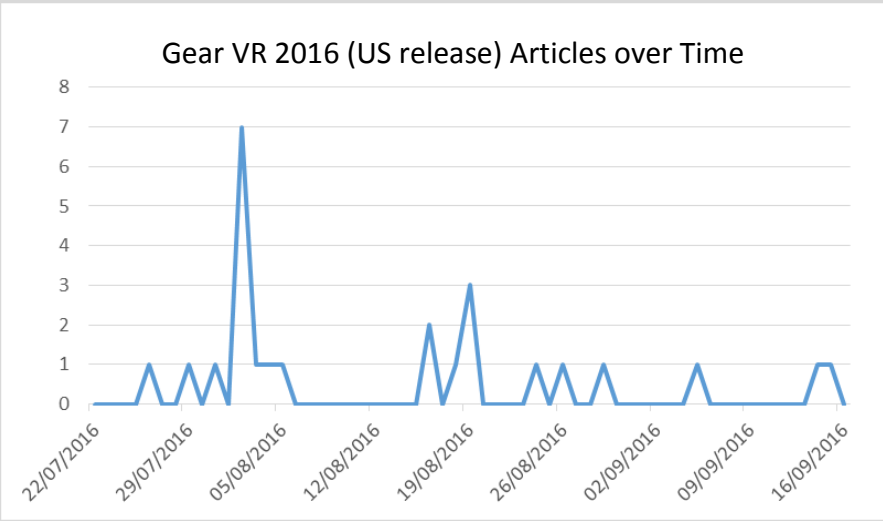
Appendix 13: Number of Articles Mentioning Each Application

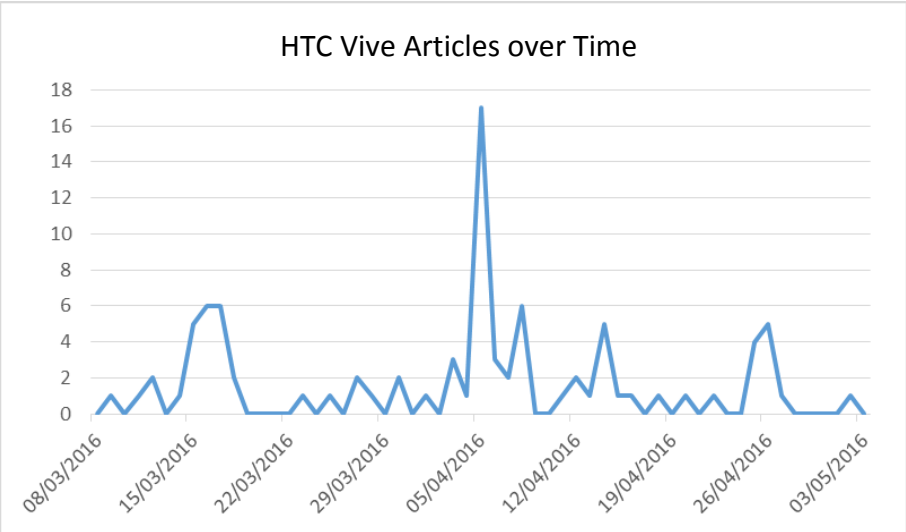


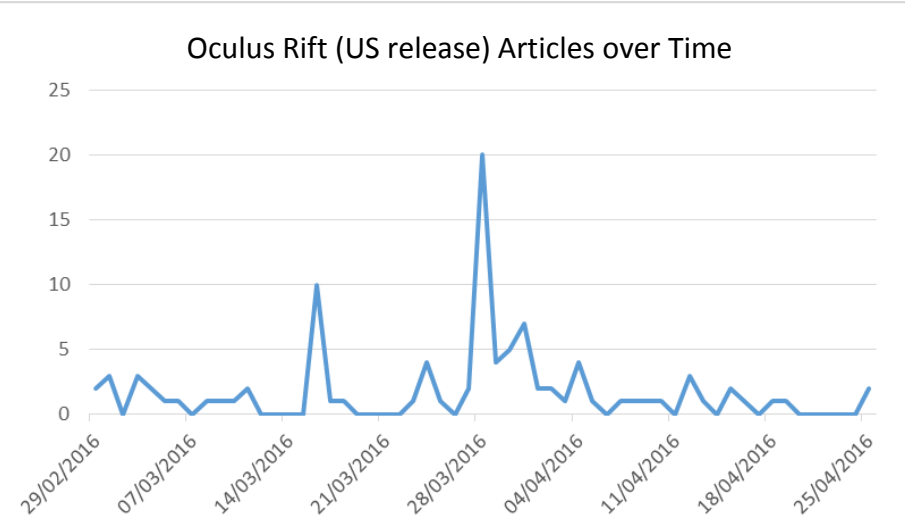
Appendix 14: Number of Articles for Each Sample Period over Time

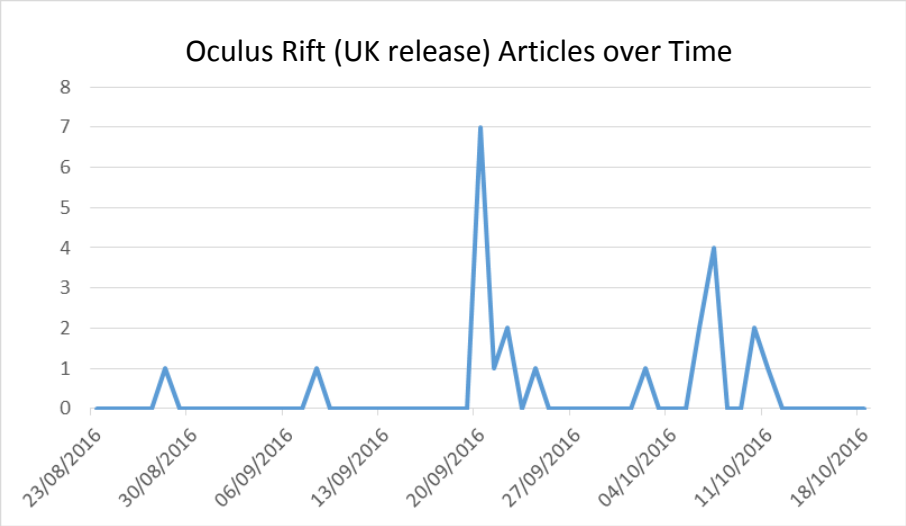


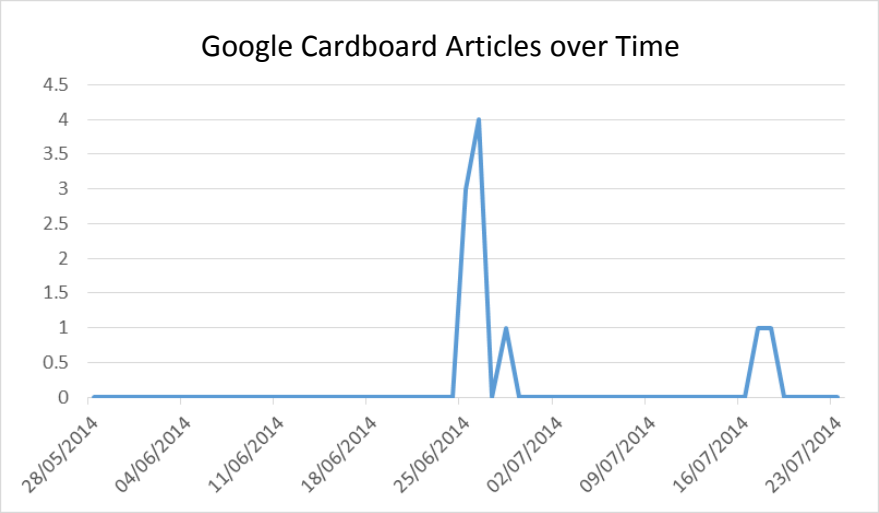





HTC Vive Articles over Time
18
16
14
12
10
8
6
4
2
0
08/03/2016
15/03/2016
22/03/2016
29/03/2016
05/04/2016
12/04/2016
19/04/2016
26/04/2016
03/05/2016


Oculus Rift (US release) Articles over Time
25
20
15
10
5
0
29/02/2016
07/03/2016
14/03/2016
21/03/2016
28/03/2016
04/04/2016
11/04/2016
18/04/2016
25/04/2016


Oculus Rift (UK release) Articles over Time
8
7
6
5
4
3
2
1
0
23/08/2016
30/08/2016
06/09/2016
13/09/2016
20/09/2016
27/09/2016
04/10/2016
11/10/2016
18/10/2016


Google Cardboard Articles over Time
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
28/05/2014
04/06/2014
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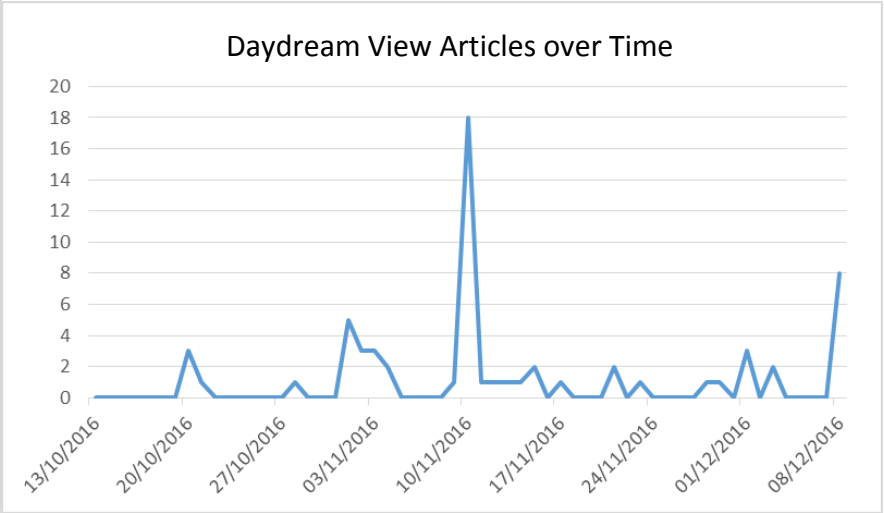
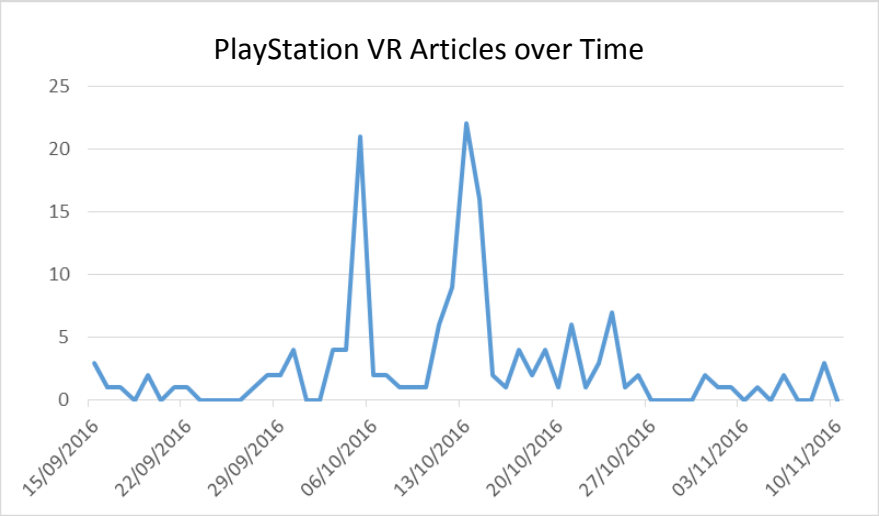
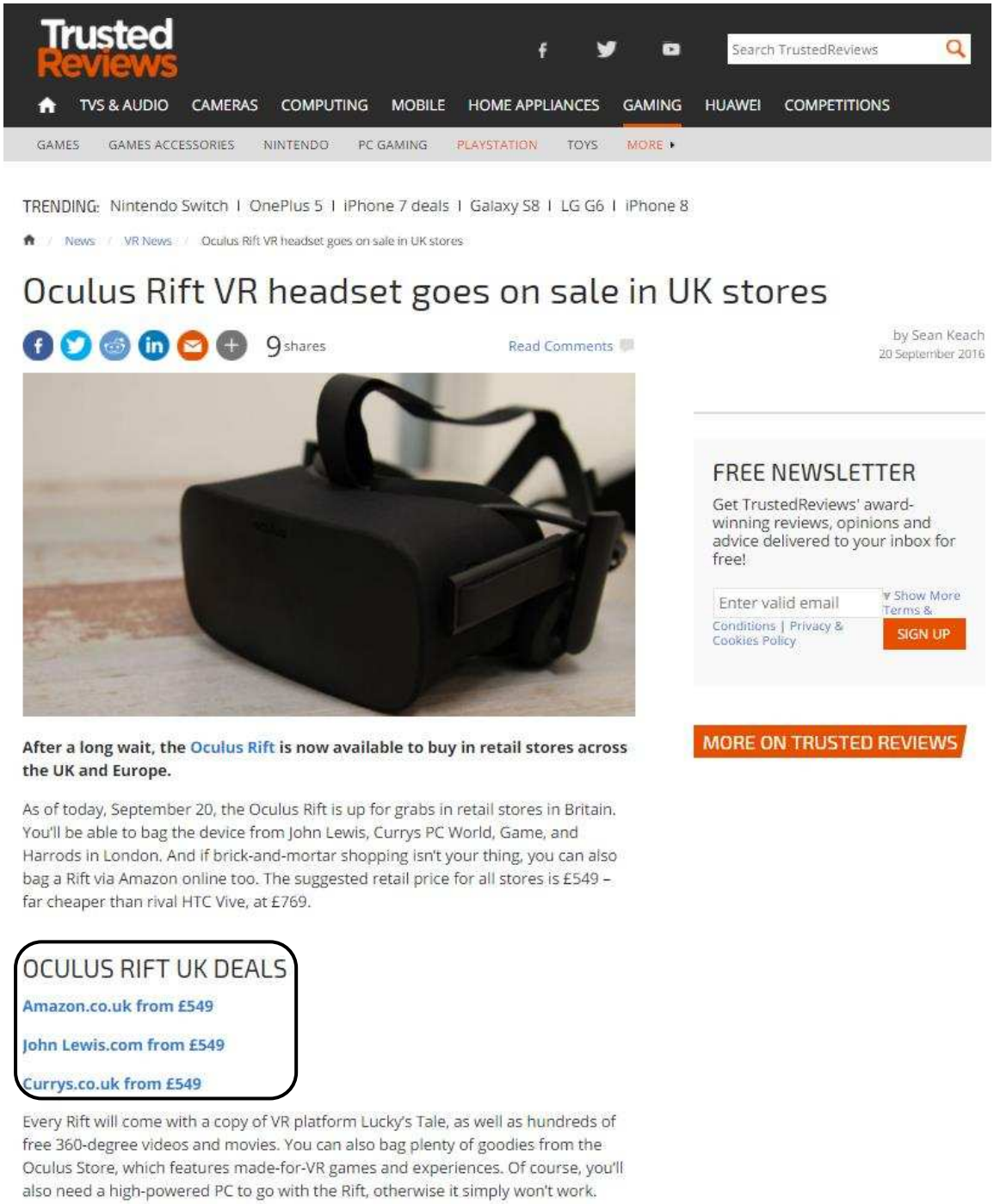
02/07/2014
09/07/2014
16/07/2014
23/07/2014


Daydream View Articles over Time
20
18
16
14
12
10
8
6
4
2
0
13/10/2016
20/10/2016
27/10/2016
03/11/2016
10/11/2016
17/11/2016
24/11/2016
01/12/2016
08/12/2016


PlayStation VR Articles over Time
25
20
15
10
5
0
15/09/2016
22/09/2016
29/09/2016
06/10/2016
13/10/2016
20/10/2016
27/10/2016
03/11/2016
10/11/2016

Appendix 15: An Article Providing Links to Retailers



Source: Keach, S. (2016) 'Oculus Rift VR headset goes on sale in UK stores', Trusted Reviews, 20 September. Available at: http://www.trustedreviews.com/news/oculus-rift-release-date-uk-buy-price-cheap-amazon (Accessed: 3 June 2017).

This screenshot shows an example of how some publications display links to buy VR devices within their articles (circled).

Appendix 16: An Article Using 'in-feed ads'

Set for release later this month, Gear VR is 19% lighter than the Innovator Edition, features a redesigned touchpad and is compatible with more Samsung smartphones.

There are quite a few games set to launch alongside or soon after the tech releases.

These titles include: Land's End by Ustwo Games, Oculus Arcade, Bandit Six: Salvo by Climax Studios, and Dead Secret by Robot Invader.

Each of the aforementioned games are now available on the Oculus Store.

Gunjack by CCP and Anshar Wars 2 by OZWE are to be released "soon".

Gear VR will be released on November 20. Amazon, Best Buy and the Samsung Store are now taking pre-orders.

Sometimes we include links to online retail stores. If you click on one and make a purchase we may receive a small commission. For more information, go here.

Source: Nunneley, S. (2015) 'Samsung Gear VR now available for pre-order at various retailers', VG247, 10 November. Available at: https://www.vg247.com/2015/11/10/samsung-gear-vr-now-available-for-pre-order-at-various-retailers/ (Accessed: 17 June 2017).

This article from VG247 lists retailers where readers can buy Samsung Gear VR (underlined). The publication also included a disclaimer (circled) explaining they receive commission if readers make a purchase through clicking on those links.